European Organisation for Astronomical Research in the Southern Hemisphere

Programme: VLT

Project/WP: Science Operations

ESPRESSO Template Reference Manual

Document Number: ESO-319964

Document Version: 1

Document Type: Manual (MAN)

Released On: 2018-10-25

Document Classification: Public

Prepared by: Ledoux, Cédric

Validated by: Kaufer, Andreas

Approved by: Kaufer, Andreas

Name

Change Record

Issue/Rev.	Date	Section/Page affected	Reason/Remarks
0.5	20/09/2011	All	First draft version
1D1	07/10/2011	All	PDR version
1D2	20/12/2012	All	First FDR version
1.0	12/03/2013	All	FDR prepared version
1.1	19/07/2013	All	Version corrected after FDR RIXes
1.2	19/04/2017	All	Updated after PAE
1.3	05/05/2018	All	Updated after commissioning 2b
1.4	01/07/2018	All	First version for ESO P102

Co-authors:

R. Cirami

P. Santin

Table of Contents

List of Tables

1 Introduction

1.1 Purpose

The purpose of this document is to describe the ESPRESSO Observation Templates. The reader of this document is assumed to be familiar with the ESPRESSO instrument having read the ESPRESSO User Manual available at:

http://www.eso.org/sci/facilities/paranal/instruments/espresso/doc.html

and to know how to use the web-based tool for the preparation of Phase 2 material, also known as p2:

https://www.eso.org/sci/observing/phase2/p2intro.html

which has recently replaced the P2PP tool.

ESPRESSO templates are characterized by TSFs (Template Signature Files) allowing the user to create OBs (Observation Blocks) of science and calibration exposures. The templates are the building blocks of science, calibration and technical or maintenance OBs.

This document logically follows the ESPRESSO Control Software User Requirements Specifications [AD-6], the ESPRESSO Calibration Plan [AD-7] and Data Reduction Library Design Description [AD-8] documents.

This document is intended as a Templates User Guide.

1.2 Scope

This document describes the ESPRESSO templates to be used during Acquisition, Observation, Calibration and Maintenance phases. Functional specifications of other parts of the VLT data flow, such as the data-reduction pipeline, are outside of its scope.

1.3 Documents

The original applicable and reference documents are listed hereafter while the most up-to-date information can be found on the ESPRESSO public WEB pages:

http://www.eso.org/sci/facilities/paranal/instruments/espresso.html

1.3.1 Applicable Documents

AD-1	ESPRESSO Statement of Work	VLT-SOW-ESO-13520-5059	1	01.02.2011
AD-2	ESPRESSO Technical Specifications	VLT-SPE-ESO-13520-4633	3	01.02.2011
AD-3	ESPRESSO Project Plan	VLT-PLA-ESP-13520-0007	5	25.03.2013
AD-4	ESPRESSO Management Plan	VLT-PLA-ESP-13520-0015	4	25.03.2013
AD-5	ESPRESSO Technical Specifications	VLT-SPE-ESO-13520-4633	3	01.02.2011
AD-6	ESPRESSO CS User Requirements Specification	VLT-SPE-ESP-13520-0040	2	12.03.2013
AD-7	ESPRESSO Calibration Plan	VLT-PLA-ESP-13520-0045	1	12.03.2013
AD-8	ESPRESSO Data Reduction Library Design Description	VLT-TRE-ESP-13520-0102	1	12.03.2013
AD-9	ESPRESSO Operational Concept Description	VLT-TRE-ESP-13520-0108	1	12.03.2013
AD-10	INS Common Software – Common Software for Templates – User Manual	VLT-MAN-ESO-17240-2240	6	20.03.2009

1.3.2 Reference Documents

RD-1	Phase 2 Preparation Tool version 3 User Manual	VLT-MAN-ESO-19200-5167	5	30.07.2012
RD-2	ESPRESSO Instrument SW Design Description	VLT-TRE-ESP-13520-0101	1	12.03.2013
RD-3	ESPRESSO Instrument Software User and Maintenance Manual	VLT-MAN-ESP-13520-0240	1	28.02.2017

1.4 Acronyms and Abbreviations

ADC	Atmospheric Dispersion Compensator
AFPS	Acquisition & Field and Pupil Stabilization

BOB	Broker for Observation Blocks
CCL	Combined Coudé Laboratory
CT	Coudé Train
EM	Exposure Meter
ESPRESSO	Echelle SPectrograph for Rocky Exoplanet and Stable Spectroscopic Observations
ETC	Exposure Time Calculator
FP	Fabry-Pérot
FPCS	Fabry-Pérot Calibration Source
FS	Field Stabilization
FS-TCCD	Field Stabilization TCCD
GUI	Graphical User Interface
LDLS	Laser Driven Light Source
LFC	Laser Frequency Comb
MS	Maintenance Software
ND	Neutral Density
OB	Observation Block
OLDB	On-Line DataBase
p2	web-based tool for the preparation of Phase 2 material
PDR	Preliminary Design Review
PS	Pupil Stabilization
RV	Radial Velocity
SNR	Signal-to-Noise Ratio
TCCD	Technical CCD
ThAr	Thorium-Argon
TSF	Template Signature File
UT	Unit Telescope
VLT	Very Large Telescope

2 Overview

The templates file set is made up by their **Template Signature File (.tsf)** and their **Sequence File (.seq)**.

The **Template Signature Files (.tsf)** contain the parameters - describing the configuration of the telescope, instrument and detector - that have to be set, including those to be specified by the observer during the Phase 2 of the observation preparation, through p2.

The **Sequence Files (.seq)** contain the code, written in Tcl language that is executed when BOB runs the template.

The templates are the building blocks of the observation and calibration OBs. An OB is the quantum of observation, i.e. a data structure containing all the parameters necessary to define a single observation.

Some templates are defined to handle the maintenance operations needed to maintain the high quality of the instrument and ensure the data accuracy.

Every operation performed on the instrument must use a dedicated template.

2.1 Instrument Modes

ESPRESSO has three main instrument modes, corresponding to the choice of a particular fibre to feed the spectrograph:

- **SINGLEHR (SINGLE High Resolution) mode.** In this mode, only one UT is used and its light brought to the instrument. In this mode, ESPRESSO is used as a standard VLT instrument. Only one fibre of 1.0” feeds the spectrograph, resulting in a resolving power of ~140,000;
- **SINGLEUHR (SINGLE Ultra High Resolution) mode.** In this mode, only one UT is used and its light brought to the instrument. In this mode, ESPRESSO is used as any standard VLT instrument. Only one fibre of 0.5” feeds the spectrograph, resulting in a very high resolving power (~190,000), at the cost of significant slit losses;
- **MULTIMR (MULTI Mid Resolution) mode [not offered in P102].** In this mode, the 4 UTs are used simultaneously and are connected to ESPRESSO. All the telescopes point to the same source and are used as a 16-m equivalent telescope. The fibres from the telescopes are brought together and their light coupled into a single larger fibre, resulting in a lower resolving power of ~70,000.

2.2 Scientific Detectors (red and blue arms)

The available binning modes for the scientific detectors are: 1x1, 2x1, 4x2 and 8x4.

The detector read-out speeds are:

- SLOW - to reach a read-out noise of 2-3 electrons per pixel;
- FAST - detector read-out time of about 30s;

The desired binning and read-out mode is used on both the blue and red detectors (no separate choice possible).

2.3 Simultaneous Reference in Fibre B

Once the instrument mode and the binning are defined, the only remaining choice concerns the light source to illuminate Fibre B. The possible options are : DARK/ SKY/ THAR/ FPCS. The standard options are SKY or FPCS.

The Fabry-Pérot reference source (FPCS) must be used if the highest RV precision is required.

On very faint targets, due to the contamination from the simultaneous reference ($<10^{-4}$), to subtract the sky background, and the fact that the RV precision will be dominated by large photon noise, it is suggested to record the sky spectrum (SKY) in Fibre B.

The THAR option is only available in case of a failure of the FP. Due to its higher wavelength-calibration accuracy, the FPCS should be preferred over the THAR lamp.

To avoid contamination from the simultaneous reference in crowded fields, the DARK option may be used instead of SKY. This will block the light at the entrance of Fibre B.

2.4 Instrument Configurations

The combination of an instrument and a detector mode defines an instrumental configuration. The available instrumental configurations are:

- **singleHR11**: SINLEHR instrument mode with 1x1 detector binning and FAST read-out;
- **singleHR21**: SINGLEHR instrument mode with 2x1 detector binning and SLOW read-out;
- **singleUHR11**: SINGLEUHR instrument mode with 1x1 detector binning and FAST read-out;
- **multiMR42 [not offered in P102]**: MULTIMR instrument mode with 4x2 detector binning and SLOW read-out;

- **multiMR84 [not offered in P102]**: MULTIMR instrument mode with 8x4 detector binning and SLOW read-out.

The configuration singleHR11 is typically used for bright-object spectroscopy and RV observations. Typically, this configuration is used together with the FPCS illuminating Fibre B.

The configuration singleHR21 is typically used for faint-object spectroscopy and RV observations. Typically, this configuration is used together with the SKY illuminating Fibre B, especially for faint targets. If the goal is RV measurements, FPCS may be chosen as well.

The configuration singleUHR11 provides the highest resolving power of ESPRESSO of ~190'000. This configuration is used for observations for which this resolving power is essential as it provides a lower SNR and a lower RV precision compared to the singleHR configurations.

Detailed calculations as to which setting will be best suited for a certain type of observation, and which constraints are required, should be performed with the ESPRESSO ETC available at:

http://www.eso.org/observing/etc

2.5 Creation of Observation Blocks

An observation block (OB) for a typical science observation with ESPRESSO consists of one acquisition template and one observation template. Both templates need to use the same instrument mode (i.e., one of singleHR, singleUHR or multiMR, the latter being not offered in P102).

The constraint set for ESPRESSO consists of the following parameters:

- Seeing;
- Airmass;
- Fraction of Lunar Illumination;
- Moon Angular Distance;
- Sky Transparency;
- Precipitable Water Vapour.

Please consult the ESPRESSO ETC available at:

http://www.eso.org/observing/etc

to define the required observing constraints and estimate the SNR.

Please enter the expected SNR at 550 nm into the instrument-specific OB comment field.

3 Templates Naming Convention

ESPRESSO Template Signature Files (TSFs) are grouped according to their functionality. The name of a TSF has the following scheme [AD-10]:

`ESPRESSO_<mode>_<type>_<description>.tsf`

where:

`mode` is the instrument configuration (*singleHR*, *singleUHR* or *multiMR* for the acquisition, observation and calibration templates);

`type` is the type of template (*acq* for acquisition, *cal* for calibration, *obs* for observation and *TEC* for technical);

`description` is a string identifying the purpose of the template.

The chosen TSF identifies the instrument mode, while the instrument configuration (section 2.4) are chosen through the DET1.MODE keyword defined when using p2. In the rest of the document, we will often refer to a specific template as `ESPRESSO_*_<type>_<description>.tsf`, where `*` is the selected instrument mode (*singleHR*, *singleUHR* or *multiMR)*.

3.1 TSF Keywords

Every TSF contains the definition and default settings for all keywords needed to run a template.

Keywords appearing in ESPRESSO TSFs are:

1. Keywords whose value has to be set by the user (through the p2 or vOT tools);
2. Keywords whose value is fixed for a given template and are hidden to the user.

The inputs for each template are described in Sect. 8.

3.2 Template List

Table 1 lists the templates supplied with ESPRESSO. The acquisition, observation and calibration ones can be used within the p2 tool for the preparation of the ESPRESSO OBs, while the technical ones can only be used on Paranal.

Type	Mode	Name

ACQUISITION	**singleHR**	1. ESPRESSO_singleHR_acq_obj 2. ESPRESSO_singleHR_acq_sky
	singleUHR	3. ESPRESSO_singleUHR_acq_obj 4. ESPRESSO_singleUHR_acq_sky
	multiMR	5. ESPRESSO_multiMR_acq_obj 6. ESPRESSO_multiMR_acq_sky
OBSERVATION	**singleHR**	7. ESPRESSO_singleHR_obs 8. ESPRESSO_singleHR_obs_snr
	singleUHR	9. ESPRESSO_singleUHR_ obs 10. ESPRESSO_singleUHR_ obs_snr
	multiMR	11. ESPRESSO_multiMR_ obs 12. ESPRESSO_multiMR_ obs_snr
CALIBRATION	**singleHR**	13. ESPRESSO_singleHR_cal_bias 14. ESPRESSO_singleHR_cal_cont 15. ESPRESSO_singleHR_cal_cte 16. ESPRESSO_singleHR_cal_dark 17. ESPRESSO_singleHR_cal_ff 18. ESPRESSO_singleHR_cal_led 19. ESPRESSO_singleHR_cal_lin 20. ESPRESSO_singleHR_cal_order 21. ESPRESSO_singleHR_cal_pix 22. ESPRESSO_singleHR_cal_skyflat 23. ESPRESSO_singleHR_cal_std 24. ESPRESSO_singleHR_cal_wave
	singleUHR	25. ESPRESSO_singleUHR_cal_bias 26. ESPRESSO_singleUHR_cal_cont 27. ESPRESSO_singleUHR_cal_cte 28. ESPRESSO_singleUHR_cal_dark 29. ESPRESSO_singleUHR_cal_ff 30. ESPRESSO_singleUHR_cal_led 31. ESPRESSO_singleUHR_cal_lin

		32. ESPRESSO_singleUHR_cal_order 33. ESPRESSO_singleUHR_cal_pix 34. ESPRESSO_singleUHR_cal_skyflat 35. ESPRESSO_singleUHR_cal_std 36. ESPRESSO_singleUHR_cal_wave
	multiMR	37. ESPRESSO_multiMR_cal_bias 38. ESPRESSO_multiMR_cal_cont 39. ESPRESSO_multiMR_cal_dark 40. ESPRESSO_multiMR_cal_ff 41. ESPRESSO_multiMR_cal_led 42. ESPRESSO_multiMR_cal_lin 43. ESPRESSO_multiMR_cal_order 44. ESPRESSO_multiMR_cal_pix 45. ESPRESSO_multiMR_cal_skyflat 46. ESPRESSO_multiMR_cal_std 47. ESPRESSO_multiMR_cal_wave
TECHNICAL		48. ESPRESSO_TEC_CTCalibFocus 49. ESPRESSO_TEC_EMFocus 50. ESPRESSO_TEC_FECalibFilter 51. ESPRESSO_TEC_FECalibFocus 52. ESPRESSO_TEC_FECalibPiezo 53. ESPRESSO_TEC_motor_current 54. ESPRESSO_TEC_preflash 55. ESPRESSO_TEC_TelescopeFocus 56. ESPRESSO_TEC_WobbleAz

Table 1: ESPRESSO templates

4 Acquisition Templates

The goal of acquisition templates is to move the telescope(s) and to perform the target acquisition. Every observation of a new target must start with an acquisition template, and be followed by one or more observation templates.

The template tries to locate the target automatically by analyzing the Field TCCD image, then asks the operator to confirm the identification or to switch to manual target selection. Once the target is identified, the appropriate coordinate offsets are sent to the telescope(s). The procedure can be repeated until the light from the target falls within the spectrograph fibre hole. At the end of the acquisition phase, the templates start the Field- and Pupil-Stabilizations loops (further details can be found in [RD-3].

The operations performed by the template are as follows:

1. Setup the telescope(s), by sending SETINSD command;
2. Move the telescope(s) to the target position;
3. Ask the operator to start telescope(s) active optics and auto guiding **(this step requires operator interaction)**;
4. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
5. Start acquisition on all required TCCDs ;
6. Start the `esortdPointing` panel (in single UT mode) or the `esortdMonitor` panel (in multi UT mode) to allow the operator to identify the target in the Field TCCD image, and bring it in the spectrograph fibre hole by sending OFFSADG commands **(this step requires operator interaction).** Before the first offset command is set, both the Field and Pupil TCCD images are saved as FITS files with `pointingFS` and `pointingPS` prefix respectively. These files will be added to the final scientific FITS file as extensions;
7. Ensure the ADC is in tracking mode;
8. Start both the field- and pupil-stabilization loops;
9. Start the `esortdStabil` panel (in single UT mode) or the `esortdMonitor` panel (in multi UT mode) to allow the operator to check the stabilization process **(this step requires operator interaction).**

The ESPRESSO instrument package contains six acquisition templates (see Table 1), two for each instrument mode. The `ESPRESSO_*_acq_obj` templates allow to run the whole acquisition template (as discussed above). The `ESPRESSO_*_acq_sky` templates run only points 1 and 2 of the above list, i.e., they simply allow to point the telescope(s) in a given

direction in the sky. Their purpose is to point the telescope to an "empty-field" position to acquire the atmosphere reflected solar spectrum via the `ESPRESSO_*_skyflat` template.

The ESPRESSO_*_acq_sky templates are not offered in service mode (SM).

Output file name: NONE

The inputs for the acquisition templates are listed in Sect. 8.1.

The telescope will preset to the specified RA and DEC, i.e.,

TEL.TARG.ALPHA and **TEL.TARG.DELTA**.

For very faint (V>20) or extended objects, offset stars have to be used to accurately position the fibre on the target. In this case, the RA and DEC coordinates in the OB are also the coordinates of the science target. The following convention between target and offset star coordinates is used:

TEL.TARG.ALPHA + **TEL.TARG.OFFSETALPHA** [arcsec] = RA(offset star)

TEL.TARG.DELTA + **TEL.TARG.OFFSETDELTA** [arcsec] = DEC(offset star)

The offsets have to be specified in arcseconds, in particular:

TEL.TARG.OFFSETALPHA [arcsec] = (RA(offset star) – **TEL.TARG.ALPHA**) * COS(**TEL.TARG.DELTA**)

In p2, the offset keywords have the labels:

TEL.TARG.OFFSETALPHA *RA blind offset*

TEL.TARG.OFFSETDELTA *DEC blind offset*

The keyword

TEL.AG.GUIDESTAR CATALOGUE/SETUPFILE/NONE *Telescope guide star selection*

determines how the guide star for the telescope is selected. With the default option CATALOGUE, the telescope will select automatically a suited guide star from the VLT guide star catalogue. This option should be appropriate for most users. If a specific guide star has to be used, the option SETUPFILE can be used; the coordinates of this guide star must then be specified via the keywords

TEL.GS1.ALPHA *RA of telescope guide star*

TEL.GS1.DELTA *DEC of telescope guide star*

If no automatic guide star acquisition is required, the option NONE has to be used for **TEL.AG.GUIDESTAR**. In this exceptional case, the guide star coordinates have to be entered manually by the telescope operator.

Setting the

OCS.OBJ.MV *Object V mag*

is mandatory as it is used for instrument operation (acquisition of the target). Setting the remaining object parameters

OCS.OBJ.BV *Object color index B-V*

OCS.OBJ.RV -100000...100000 *Guess Radial Velocity (km/s)*

OCS.OBJ.SP.TYPE *Object spectral type (e.g. G2)*

OCS.OBJ.Z.EM *Object redshift from emission lines*

is optional. They are passed to the ESPRESSO Data Reduction Software (DRS) and are needed for an optimized radial-velocity computation of stellar spectra. **OCS.OBJ.Z.EM** is intended for extragalactic sources and is used as input to the QSO branch of the ESPRESSO Data Analysis Software (DAS).

5 Observation Templates

The observation templates allow to perform scientific exposures with ESPRESSO. Six observation templates are foreseen (see Table 1), two for each instrument mode. The `ESPRESSO_*_obs` templates run with a fixed exposure time, while the `ESPRESSO_*_obs_snr` ones run until a given SNR has been reached (within the maximum exposure time set by the *SEQ.MAX.EXPTIME* keyword). The current SNR is evaluated as the square root of the cumulated (background-subtracted) counts in the exposure meter multiplied by the value of the EM.COUNTRATIO configuration keyword.

For each instrument mode, two fibres feed the spectrograph: the science fibre (fibre A) and the calibration/sky fibre (fibre B), and ESPRESSO will record the two spectra simultaneously.

The operations performed by the template are as follows:

1. Setup the front end translational stage for calibration injection to feed fibre B with either light from the sky or from a calibration lamp, and optionally switch on the lamp;
2. Perform the required number of scientific exposures with either fixed exposure time (`ESPRESSO_*_obs` templates) or until a given SNR ratio is reached (`ESPRESSO_*_obs_snr` templates);
3. During the exposure(s) check the Field- and Pupil-stabilization loops are running properly. If an error occurs, the operator is notified with a dialog.

The ESPRESSO_*_obs_snr templates are not offered in service mode (SM).

Output file name: `ESPRESSO_*_OBS<DayOfYear_sequential>.fits`

where `*` is the selected instrument mode.

The inputs for the observation templates are listed in Sect. 8.2.

For the singleHR and multiMR instrument modes, the user has the choice between two detector binning/readout mode combinations as described in Sect. 2.4. The corresponding keyword is

DET1.MODE 1x1_FAST/2x1_SLOW/4x2_SLOW/8x4_SLOW *Binning/Readout mode*

The light source to illuminate Fibre B (see Sect. 2.3) is controlled by

SEQ.CALSOURCEB DARK/SKY/THAR/FPCS *Source on fibre B*

while the daytime wavelength-calibration source used for the automatic processing of the science spectrum from Fibre A is specified via

OCS.WAVECAL.SOURCE THAR/LFC *Calib. associated to fibre A*

Since the LFC is still in an experimental phase, we recommend the user to choose the THAR option for the time being.

6 Calibration Templates

The available ESPRESSO calibration templates are:

- **Detector Bias** (`ESPRESSO_*_cal_bias`, Sect. 6.1)**:** measure detector bias level and read-out noise;
- **Order Definition** (`ESPRESSO_*_cal_order`, Sect. 6.8)**:** identify and trace spectral orders and slices on the detector;
- **Flat-field, Blaze and Order Profile** (`ESPRESSO_*_cal_ff`, Sect. 6.5)**:** perform spectral flat-field to determine the relative pixel-response and the blaze-response along the order;
- **Wavelength calibration** (`ESPRESSO_*_cal_wave`, Sect. 6.12)**:** determine the relation between detector pixels and wavelength;
- **Contamination by Simultaneous Reference** (`ESPRESSO_*_cal_cont`, Sect. 6.2)**:** measure cross-fibre contamination on fibre A from the simultaneous reference on fibre B;
- **Detector Dark Current** (`ESPRESSO_*_cal_dark`, Sect. 6.4)**:** measure the average dark current and a list of hot pixels;
- **Detector Flat-field and Gain Measurement** (`ESPRESSO_*_cal_led`, Sect. 6.6)**:** characterize CCD cosmetics (bad pixel mask), detector flat-field and gain (illumination with LEDs);
- **Detector pixel geometry** (`ESPRESSO_*_cal_pix`, Sect. 6.9)**:** compute the variations of pixel size along the spectral orders;
- **Detector linearity** (`ESPRESSO_*_cal_lin`, Sect. 6.7)**:** measure the detector linearity;
- **Fibre-to-fibre Relative Efficiency** (`ESPRESSO_*_cal_skyflat`, Sect. 6.10)**:** measure relative efficiency of fibre B vs. fibre A as a function of wavelength;
- **Spectrophotometric Calibration** (`ESPRESSO_*_cal_std`, Sect. 6.11)**:** measure absolute efficiency of the instrument as a function of wavelength, as computed by comparing the spectrum of a spectrophotometric standard star with sky simultaneous reference;
- **Charge transfer efficiency** (`ESPRESSO_*_cal_cte`, Sect. 6.3): measure the detector charge transfer efficiency.

The inputs for the calibration templates are listed in Sect. 8.3.

The value of the DET1.UIT1 (scientific detector exposure time), INS.VFILTA.DEN and INS.VFILTB.DEN (calibration lamp variable filter density) keywords for the following templates:

- `ESPRESSO_*_cal_cont`
- `ESPRESSO_*_cal_ff`
- `ESPRESSO_*_cal_order`
- `ESPRESSO_*_cal_wave`

are set by default to -1. This way, the actual values for the DET1.UIT1, INS.VFILTA.DEN and INS.VFILTB.DEN keywords are automatically calculated to ensure that approximately the same flux is recorded in each exposure, regardless of the observing mode, the detector binning and the lamp being used. The parametrization for such calculation is stored in the `esmcfgTemplate.cfg` file.

If needed, such calculation can be bypassed by providing non-negative values for the DET1.UIT1, INS.VFILTA.DEN and INS.VFILTB.DEN keywords.

6.1 ESPRESSO_*_cal_bias

Bias frames to measure bias level and read-out noise. The detector will be read with zero exposure time and shutter closed. The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_*_BIAS<DayOfYear_sequential>.fits`

where `*` is the selected instrument mode.

6.2 ESPRESSO_*_cal_cont

Measurement of contamination light induced on fibre A by simultaneous reference (ThAr lamp, Fabry-Pérot étalon, LFC) on fibre B. Fibre A is dark, while calibration light is injected into fibre B as in a science exposure with simultaneous reference.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_*_CONTAM<DayOfYear_sequential>.fits`

where * is the selected instrument mode.

6.3 ESPRESSO_*_cal_cte

Measures the detector charge transfer efficiency. A sequence of frames is acquired with the FP source on both fibres, using different ND filters in front of the lamps: The filter on fibre A has always ND=1. The filter densities on fibre B are provided by the user through the *SEQ.CTE.NDFILT* keyword as a list of values separated by blanks. For each filter density value the template perform *SEQ.NO* exposures, hence the total number of exposures is given by: <number of filter densities> * *SEQ.NO*.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_*_CTE<DayOfYear_sequential>.fits`

where * is the selected instrument mode.

6.4 ESPRESSO_*_cal_dark

Performs dark exposures. Exposure time is long (~1 hour) to be able to measure dark current and identify hot pixels.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_*_DARK<DayOfYear_sequential>.fits`

where * is the selected instrument mode.

6.5 ESPRESSO_*_cal_ff

Flat-field, blaze and order profile frame for fibres A and B. A continuum light source is used to illuminate one fibre, while the other is dark.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Switch on the LDLS calibration source;
3. Send calibration light to fibre A, while the fibre B is dark;
4. Perform the required number of exposures with the scientific detector.
5. Send calibration light to fibre B, while the fibre A is dark;
6. Perform the required number of exposures with the scientific detector.

NOTE: the total number of exposures taken by this template is twice the value of the *SEQ.NO* keyword.

Output file name: `ESPRESSO_*_FLAT<DayOfYear_sequential>.fits`

where * is the selected instrument mode.

6.6 ESPRESSO_*_cal_led

Detector flat-field, illuminated by LED, to characterize CCD cosmetics (bad pixel mask) and measure the gain. A sequence of frames is taken with exposure time is given by:

$$T_{exp} = i * (SEQ.MAX.EXPTIME / SEQ.NSTEPS)$$

where *i* runs from 1 to *SEQ.NSTEPS*. For each value of T_{exp} the template performs SEQ.NO exposures, hence the total number of exposures is given by: *SEQ.NSTEPS * SEQ.NO*.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_*_LED<DayOfYear_sequential>.fits`

where * is the selected instrument mode.

6.7 ESPRESSO_*_cal_lin

Performs detector linearity measurements. A sequence of frames is acquired with the FP source on both fibres, using different exposure times spanning the whole detector dynamic range. The exposure times are provided by the user through the *SEQ.LIN.EXPTIMES* keyword as a list of exposure times separated by blanks. For each exposure time the template perform *SEQ.NO* exposures, hence the total number of exposures is given by: <number of exposure times> * *SEQ.NO*.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_*_LINEARITY<DayOfYear_sequential>.fits`

where * is the selected instrument mode.

6.8 ESPRESSO_*_cal_order

Order/slice definition frame for fibres A and B (identification and tracing). A continuum light source is used to illuminate one fibre, while the other is dark.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Switch on the LDLS calibration source;
3. Send calibration light to fibre A, while the fibre B is dark;
4. Perform the required number of exposures with the scientific detector.
5. Send calibration light to fibre B, while the fibre A is dark;
6. Perform the required number of exposures with the scientific detector.

NOTE: the total number of exposures taken by this template is twice the value of the *SEQ.NO* keyword.

Output file name: `ESPRESSO_*_ORDERDEF<DayOfYear_sequential>.fits`

where * is the selected instrument mode.

6.9 ESPRESSO_*_cal_pix

Performs calibration of pixel size variations along spectral orders. A sequence of frames is acquired with the LFC source on both fibres.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_*_GEOMETRY<DayOfYear_sequential>.fits`

where * is the selected instrument mode.

6.10 ESPRESSO_*_cal_skyflat

Relative efficiency of fibre B vs. fibre A as a function of wavelength. The telescope is pointed at daylight or twilight sky and skylight is injected into both fibres. The obtained relative efficiency is used to subtract the sky on science exposures with simultaneous sky.

NOTE: this template must always follow a `ESPRESSO_*_acq_sky` template in the same OB.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_*_EFF<DayOfYear_sequential>.fits`

where * is the selected instrument mode.

6.11 ESPRESSO_*_cal_std

A spectrophotometric standard star is observed with sky simultaneous reference on fibre B, and the absolute efficiency of the instrument as a function of wavelength is computed from the comparison between observed spectrum and reference flux table.

NOTE: this template must always follow a `ESPRESSO_*_acq_obj` template in the same OB.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_*_FLUX<DayOfYear_sequential>.fits`

where `*` is the selected instrument mode.

6.12 ESPRESSO_*_cal_wave

Wavelength calibration and drift reference exposure with combinations of different calibration sources (ThAr lamp, Fabry-Pérot étalon, LFC) on both fibres. 2 frames are required.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_*_WAVE<DayOfYear_sequential>.fits`

where `*` is the selected instrument mode.

7 Technical Templates

The ESPRESSO instrument is a very stable instrument with a fixed configuration. To check the instrument status over long periods or after earthquakes, the requirement is to run the calibration templates (according to the calibration plan) along with the associated data reduction. The outputs of the data reduction provide all the quality control required to assess the instrument performance and usability.

The maintenance templates are not meant to provide instrument quality checks. Rather, they are used to either find the best focus, or calibrate specific devices. Their use is limited to instrument/software specialists.

The inputs for the technical templates are listed in Sect. 8.4.

7.1 ESPRESSO_TEC_CTCalibFocus

Searches for the best front end focus position analyzing the images of the Coude` train alignment source.

Frequency : TBD, or after an earthquake.

NOTE: this template must be executed after the Coude` train alignment source has been switched on.

The operations performed by the template are as follows:

1. Set the front end ND filter position according to the *SEQ.FILTER* keyword, the piezo X and Y positions according to the *SEQ.PIEZO_X* and *SEQ.PIEZO_Y* keywords;
2. Start acquiring image from the Field TCCD;
3. Span the focus positions between *SEQ.FOCUS0* and *SEQ.FOCUS1* positions (in degrees) with *SEQ.N_EXP* steps;
4. For each sample analyze the image by fitting a Gaussian profile to each peak in the alignment source image, and save the fitting parameters. Up to *SEQ.PEAKNO* peaks are fitted simultaneously, with a FWHM first guess given by *SEQ.FWHMGUESS* (in pixel);
5. After *SEQ.N_EXP* steps dump all collected data on a file;

Output file name: `~espr/DATA/<SEQ.FILENAME>_<timestamp>.data`

Example of output data:

```
#   PiezoX PiezoY Focus FiltName     TCCD_X   TCCD_Y   FWHM_X   FWHM_Y    Norm.
FITS_file

1    16383  16383  1.00  FSND00          0        0        0        0        0
CTCalibFocus…

2    16383  16383  2.26  FSND00          0        0        0        0        0
CTCalibFocus…

...
```

7.2 ESPRESSO_TEC_EMFocus

Spans the front end focus positions and show the focus position vs. exposure meter counts plot.

NOTE: this template must be executed after a `ESPRESSO_*_acq_obj` template, to ensure light from a star is being injected in the spectrograph fibre A.

The operations performed by the template are as follows:

1. Set the exposure meter filter density according to the *INS.FILT.NAME* keyword;
2. Start acquiring image from the exposure meter;
3. Span the front end focus range between *SEQ.FOCUS0* and *SEQ.FOCUS1* positions (in mm) with *SEQ.N_EXP* steps;
4. For each sample save the current counts on the exposure meter;
5. After *SEQ.N_EXP* steps dump all collected data on a file;
6. Run the `esmseqFocus` script to show the focus position vs. exposure meter counts plot.

Output file name: `~espr/DATA/<SEQ.FILENAME>_<timestamp>.data`

Example of output data:

```
#  Focus     Counts

1      1      21973

2      2      23437

...
```

7.3 ESPRESSO_TEC_FECalibFilter

Spans the Field ND filter positions and show the filter position vs. Field image luminosity plot.

NOTE: this template must be executed after a `ESPRESSO_*_acq_obj` template, to ensure light from a star is being injected in the spectrograph fibre A.

The operations performed by the template are as follows:

1. Set the front end focus position according to the *SEQ.FOCUS* keyword, the piezo X and Y positions according to the *SEQ.PIEZO_X* and *SEQ.PIEZO_Y* keywords;
2. Start acquiring image from the Field TCCD;
3. Span the Field ND filter positions between *SEQ.FILTER0* and *SEQ.FILTER1* positions (in degrees) with *SEQ.N_EXP* steps;
4. For each sample analyze the image by fitting a Gaussian profile to the star image, and save the resulting star luminosity;
5. After *SEQ.N_EXP* steps dump all collected data on a file;
6. Run the `esmseqFECalibFilter` script to show the filter position vs. star luminosity plot.

Output file name: `~espr/DATA/<SEQ.FILENAME>_<timestamp>.data`

Example of output data:

```
#   PiezoX PiezoY Focus FiltDeg     TCCD X   TCCD Y   FWHM X   FWHM Y    Norm.    BaryX  BaryY   FITS
file

1    16383  16383 14.00    0.11          0        0        0        0        0       0      0
FECalibFilter...

2    16383  16383 14.00   19.06          0        0        0        0        0       0      0
FECalibFilter...

...
```

7.4 ESPRESSO_TEC_FECalibFocus

Searches for the best front end focus position analyzing the images of a star on the Field TCCD.

Frequency : TBD, likely every night (before observations).

NOTE: this template must be executed after a `ESPRESSO_*_acq_obj` template, to ensure light from a star is being injected in the spectrograph fibre A.

The operations performed by the template are as follows:

1. Set the front end ND filter position according to the *SEQ.FILTER* keyword, the piezo X and Y positions according to the *SEQ.PIEZO_X* and *SEQ.PIEZO_Y* keywords;
2. Start acquiring image from the Field TCCD;
3. Span the focus positions between *SEQ.FOCUS0* and *SEQ.FOCUS1* positions (in degrees) with *SEQ.N_EXP* steps;
4. For each sample analyze the image by fitting a Gaussian profile to the star image, and save the fitting parameters;
5. After *SEQ.N_EXP* steps dump all collected data on a file;
6. Run the `esmseqFECalibFocus` script to show the focus position vs. FWHM of the star image along the X and Y directions, and vs. the star image luminosity;
7. Prompt the operator to choose among the following focus positions:
    - the focus position read before running the template;
    - default value: 16.5 mm;
    - the focus corresponding to the minimum FWHM of the star image along the X directions of the Field TCCD;
    - the focus corresponding to the minimum FWHM of the star image along the Y directions of the Field TCCD;
    - the focus corresponding to the maximum star luminosity ;
    - the focus corresponding to the best fit center value of a Gaussian profile to the star luminosity vs. focus position plot;
8. Set the front end focus according to the user choice.

Output file name: `~espr/DATA/<SEQ.FILENAME>_<timestamp>.data`

Example of output data:

```
#    PiezoX PiezoY Focus FiltDeg     TCCD X    TCCD Y    FWHM X    FWHM Y     Norm.     BaryX  BaryY  FITS
file

1     16383  16383  1.00    0.11          0         0         0         0         0         0      0
FECalibFocus...

2     16383  16383  2.26    0.11          0         0         0         0         0         0      0
FECalibFocus...

...
```

7.5 ESPRESSO_TEC_FECalibPiezo

Spans the piezo X and Y ranges positions and show the piezo positions vs. star image positions plot.

NOTE: this template must be executed after a `ESPRESSO_*_acq_obj` template, to ensure light from a star is being injected in the spectrograph fibre A.

The operations performed by the template are as follows:

1. Set the front end focus position according to the *SEQ.FOCUS* keyword, and the front end ND filter position according to the *SEQ.FILTER* keyword;
2. Start acquiring image from the Field TCCD;
3. Span the piezo X direction between *SEQ.PIEZO_X0* and *SEQ.PIEZO_X1* positions (in eng. units), and the piezo Y direction between *SEQ.PIEZO_Y0* and *SEQ.PIEZO_Y1* positions (in eng. units) with *SEQ.N_EXP* steps;
4. For each sample analyze the image by fitting a Gaussian profile to the star image, and save the resulting star positions;
5. After *SEQ.N_EXP* steps dump all collected data on a file;
6. Run the `esmseqFECalibPiezo` script to show the piezo positions vs. star image positions plot. The plot also shows the result of the linear fit between piezo positions vs. star image positions with two parameters. The fitted slopes are suitable to be used as values for the `INSi.STABIL2.PIXEL2ENGX` and `INSi.STABIL2.PIXEL2ENGY` configuration values.

Output file name: `~espr/DATA/<SEQ.FILENAME>_<timestamp>.data`

Example of output data:

```
#   PiezoX PiezoY Focus FiltDeg     TCCD X   TCCD Y   FWHM X   FWHM Y    Norm.    BaryX  BaryY   FITS
file

1        0      0 14.00    0.11          0        0        0        0        0        0      0
FECalibPiezo...

2     1725   1725 14.00    0.11          0        0        0        0        0        0      0
FECalibPiezo...


...
```

7.6 ESPRESSO_TEC_preflash

Performs an exposure with the scientific detectors with a preliminary flash illumination whose duration is given by the *DET1.PFLASH1.EXPTIME* keyword.

The operations performed by the template are as follows:

1. Setup ESPRESSO devices (according to the TSF keywords specified during the preparation of the OB);
2. Perform the required number of exposures with the scientific detector.

Output file name: `ESPRESSO_TEC_FLAT<DayOfYear_sequential>.fits`

7.7 ESPRESSO_TEC_TelescopeFocus

Spans the telescope focus positions, fit the resulting star image on the Field TCCD with a Gaussian parameter and save results in a file.

Frequency : TBD.

NOTE: this template must be executed after an `ESPRESSO_*_acq_obj` template, to ensure light from a star is being injected in the spectrograph fibre A.

The operations performed by the template are as follows:

1. Start acquiring image from the Field TCCD;
2. Span the telescope focus range between *SEQ.FOCUS0* and *SEQ.FOCUS1* positions (in mm) with *SEQ.N_EXP* steps. The telescope focus is set by changing the last parameter of the `SETINSD` command. At each step the template ask the operator stop and start the active guiding
3. For each sample analyze the image by fitting a Gaussian profile to the star image, and save the fitting parameters;
4. After *SEQ.N_EXP* steps dump all collected data on a file.

Output file name: `~espr/DATA/<SEQ.FILENAME>_<timestamp>.data`

Example of output data:

```
#    Focus     TCCD X   TCCD Y   FWHM X   FWHM Y    Norm.   FITS file
1        0      291.4      277    16.52    11.95     1066   TelescopeFocus...
2        5      291.4      277    16.52    11.95     1066   TelescopeFocus...
...
```

7.8 ESPRESSO_TEC_WobbleAz

Estimates the wobble in the pupil image while the telescope rotates in azimuth, and show the azimuth vs. X and Y image positions plot. Also show a X vs. Y position plot.

The operations performed by the template are as follows:

1. Start acquiring image from the Field (if *SEQ.USE_FS*=T) and Pupil (if *SEQ.USE_PS*=T) TCCDs;
2. Prompt the operator to switch on the pupil beacon;
3. Span the telescope pointing coordinates in azimuth between *SEQ.AZ_0* and *SEQ.AZ_1* (in degrees), with *SEQ.N_EXP* steps. The altitude is fixed at *SEQ.ALT* (in degrees);
4. Save Field (if *SEQ.USE_FS*=T) and Pupil (if *SEQ.USE_PS*=T) images;
5. For each sample analyze the Pupil image by fitting a Gaussian profile to the beacon image, and save the fitting parameters;
6. After *SEQ.N_EXP* steps dump all collected data on a file;
7. Run the `esmseqWobble` script to show the the azimuth vs. X and Y image positions plot. Also show a X vs. Y position plot.

Output file name: `~espr/DATA/<SEQ.FILENAME>_<timestamp>.data`

Example of output data:

```
#    Alt  Az    TCCD X   TCCD Y   FWHM X   FWHM Y    Norm.   FITS file
1     45   0     291.4      277    16.52    11.95     1066   WobbleAz...
2     45  10     291.4      277    16.52    11.95     1066   WobbleAz...
...
```

8 ESPRESSO Template Signature Files

In the following sections, all the currently defined ESPRESSO TSFs are listed together with their free and fixed parameters.

When using the p2 tool, the user is allowed to choose a value only for those keywords which *do not* have a value in the third column of the lists below. The remaining keyword values are fixed to the value given in this column.

8.1 Acquisition Templates

8.1.1 ESPRESSO_multiMR_acq_obj

Keyword	Type	Value	Default	Range	Help
OCS.OBJ.BV	number		0.0		Object color index B-V
OCS.OBJ.MV	number		NODEFAULT		Object V mag
OCS.OBJ.RV	number		0.0	-100000..100000	Object Radial Velocity (km/s)
OCS.OBJ.SP.TYPE	string		G2		Object spectral type (e.g. G2)
OCS.OBJ.Z.EM	number		0.0		Object redshift from emission lines
SEQ.PRESET	boolean		T	T F	Preset flag
TEL.AG.GUIDESTAR	keyword		CATALOGUE	NONE SETUPFILE CATALOGUE	Telescope guide star selection
TEL.GS1.ALPHA	coord		0		RA of telescope guide star
TEL.GS1.DELTA	coord		0		DEC of telescope guide star
TEL.TARG.ADDVELALPHA	number		0.0		Differential tracking in RA
TEL.TARG.ADDVELDELTA	number		0.0		Differential tracking in DEC
TEL.TARG.ALPHA	coord		0		RA
TEL.TARG.DELTA	coord		-850000		DEC
TEL.TARG.EPOCH	number		2000	-2000..3000	Epoch
TEL.TARG.EQUINOX	number		2000	-2000..3000	Equinox
TEL.TARG.NAME	string		Generic		Name of the target
TEL.TARG.OFFSETALPHA	number		0.0		RA blind offset
TEL.TARG.OFFSETDELTA	number		0.0		DEC blind offset

TEL.TARG.PMA	number		0.0	-10..10	Proper Motion Alpha
TEL.TARG.PMD	number		0.0	-10..10	Proper Motion Delta
INS.MODE	keyword	MULTIMR			Instrument Mode
TEL.ROT.OFFANGLE	number	0.0			Rotator on Sky (=-PA on Sky)
TEL.TARG.TYPE	keyword	COORDINATE			Target type
TEL.TARG.WLENGTH	number	600			Telescope tracking wavelength

8.1.2 ESPRESSO_singleHR_acq_obj

Keyword	Type	Value	Default	Range	Help
OCS.OBJ.BV	number		0.0		Object color index B-V
OCS.OBJ.MV	number		NODEFAULT		Object V mag
OCS.OBJ.RV	number		0.0	-100000..100000	Object Radial Velocity (km/s)
OCS.OBJ.SP.TYPE	string		G2		Object spectral type (e.g. G2)
OCS.OBJ.Z.EM	number		0.0		Object redshift from emission lines
SEQ.PRESET	boolean		T	T F	Preset flag
TEL.AG.GUIDESTAR	keyword		CATALOGUE	NONE SETUPFILE CATALOGUE	Telescope guide star selection
TEL.GS1.ALPHA	coord		0		RA of telescope guide star
TEL.GS1.DELTA	coord		0		DEC of telescope guide star
TEL.TARG.ADDVELALPHA	number		0.0		Differential tracking in RA
TEL.TARG.ADDVELDELTA	number		0.0		Differential tracking in DEC
TEL.TARG.ALPHA	coord		0		RA
TEL.TARG.DELTA	coord		-850000		DEC
TEL.TARG.EPOCH	number		2000	-2000..3000	Epoch
TEL.TARG.EQUINOX	number		2000	-2000..3000	Equinox
TEL.TARG.NAME	string		Generic		Name of the target
TEL.TARG.OFFSETALPHA	number		0.0		RA blind offset
TEL.TARG.OFFSETDELTA	number		0.0		DEC blind offset
TEL.TARG.PMA	number		0.0	-10..10	Proper Motion Alpha
TEL.TARG.PMD	number		0.0	-10..10	Proper Motion Delta

INS.MODE	keyword	SINGLEHR			Instrument Mode
TEL.ROT.OFFANGLE	number	0.0			Rotator on Sky (=-PA on Sky)
TEL.TARG.TYPE	keyword	COORDINATE			Target type
TEL.TARG.WLENGTH	number	600			Telescope tracking wavelength

8.1.3 ESPRESSO_singleUHR_acq_obj

Keyword	Type	Value	Default	Range	Help
OCS.OBJ.BV	number		0.0		Object color index B-V
OCS.OBJ.MV	number		NODEFAULT		Object V mag
OCS.OBJ.RV	number		0.0	-100000..100000	Object Radial Velocity (km/s)
OCS.OBJ.SP.TYPE	string		G2		Object spectral type (e.g. G2)
OCS.OBJ.Z.EM	number		0.0		Object redshift from emission lines
SEQ.PRESET	boolean		T	T F	Preset flag
TEL.AG.GUIDESTAR	keyword		CATALOGUE	NONE SETUPFILE CATALOGUE	Telescope guide star selection
TEL.GS1.ALPHA	coord		0		RA of telescope guide star
TEL.GS1.DELTA	coord		0		DEC of telescope guide star
TEL.TARG.ADDVELALPHA	number		0.0		Differential tracking in RA
TEL.TARG.ADDVELDELTA	number		0.0		Differential tracking in DEC
TEL.TARG.ALPHA	coord		0		RA
TEL.TARG.DELTA	coord		-850000		DEC
TEL.TARG.EPOCH	number		2000	-2000..3000	Epoch

TEL.TARG.EQUINOX	number		2000	-2000..3000	Equinox
TEL.TARG.NAME	string		Generic		Name of the target
TEL.TARG.OFFSETALPHA	number		0.0		RA blind offset
TEL.TARG.OFFSETDELTA	number		0.0		DEC blind offset
TEL.TARG.PMA	number		0.0	-10..10	Proper Motion Alpha
TEL.TARG.PMD	number		0.0	-10..10	Proper Motion Delta
INS.MODE	keyword	SINGLEUHR			Instrument Mode
TEL.ROT.OFFANGLE	number	0.0			Rotator on Sky (=-PA on Sky)
TEL.TARG.TYPE	keyword	COORDINATE			Target type
TEL.TARG.WLENGTH	number	600			Telescope tracking wavelength

8.1.4 ESPRESSO_multiMR_acq_sky

Keyword	Type	Value	Default	Range	Help
OCS.OBJ.BV	number		0.0		Object color index B-V
OCS.OBJ.MV	number		NODEFAULT		Object V mag
OCS.OBJ.RV	number		0.0	-100000..100000	Object Radial Velocity (km/s)
OCS.OBJ.SP.TYPE	string		G2		Object spectral type (e.g. G2)
OCS.OBJ.Z.EM	number		0.0		Object redshift from emission lines
SEQ.PRESET	boolean		T	T F	Preset flag
TEL.AG.GUIDESTAR	keyword		CATALOGUE	NONE SETUPFILE CATALOGUE	Telescope guide star selection
TEL.GS1.ALPHA	coord		0		RA of telescope guide star
TEL.GS1.DELTA	coord		0		DEC of telescope guide star
TEL.TARG.ADDVELALPHA	number		0.0		Differential tracking in RA
TEL.TARG.ADDVELDELTA	number		0.0		Differential tracking in DEC
TEL.TARG.ALPHA	coord		0		RA
TEL.TARG.DELTA	coord		-850000		DEC
TEL.TARG.EPOCH	number		2000	-2000..3000	Epoch
TEL.TARG.EQUINOX	number		2000	-2000..3000	Equinox
TEL.TARG.NAME	string		Generic		Name of the target
TEL.TARG.OFFSETALPHA	number		0.0		RA blind offset
TEL.TARG.OFFSETDELTA	number		0.0		DEC blind offset
TEL.TARG.PMA	number		0.0	-10..10	Proper Motion Alpha
TEL.TARG.PMD	number		0.0	-10..10	Proper Motion Delta

INS.CALSEL.NAME	keyword	TRG_SKY			Instrument FE Calibration Injection Slide
INS.MODE	keyword	MULTIMR			Instrument Mode
TEL.ROT.OFFANGLE	number	0.0			Rotator on Sky (=-PA on Sky)
TEL.TARG.TYPE	keyword	COORDINATE			Target type
TEL.TARG.WLENGTH	number	600			Telescope tracking wavelength

8.1.5 ESPRESSO_singleHR_acq_sky

Keyword	Type	Value	Default	Range	Help
OCS.OBJ.BV	number		0.0		Object color index B-V
OCS.OBJ.MV	number		NODEFAULT		Object V mag
OCS.OBJ.RV	number		0.0	-100000..100000	Object Radial Velocity (km/s)
OCS.OBJ.SP.TYPE	string		G2		Object spectral type (e.g. G2)
OCS.OBJ.Z.EM	number		0.0		Object redshift from emission lines
SEQ.PRESET	boolean		T	T F	Preset flag
TEL.AG.GUIDESTAR	keyword		CATALOGUE	NONE SETUPFILE CATALOGUE	Telescope guide star selection
TEL.GS1.ALPHA	coord		0		RA of telescope guide star
TEL.GS1.DELTA	coord		0		DEC of telescope guide star
TEL.TARG.ADDVELALPHA	number		0.0		Differential tracking in RA
TEL.TARG.ADDVELDELTA	number		0.0		Differential tracking in DEC
TEL.TARG.ALPHA	coord		0		RA
TEL.TARG.DELTA	coord		-850000		DEC
TEL.TARG.EPOCH	number		2000	-2000..3000	Epoch
TEL.TARG.EQUINOX	number		2000	-2000..3000	Equinox
TEL.TARG.NAME	string		Generic		Name of the target
TEL.TARG.OFFSETALPHA	number		0.0		RA blind offset
TEL.TARG.OFFSETDELTA	number		0.0		DEC blind offset
TEL.TARG.PMA	number		0.0	-10..10	Proper Motion Alpha
TEL.TARG.PMD	number		0.0	-10..10	Proper Motion Delta

INS.CALSEL.NAME	keyword	TRG_SKY			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEHR			Instrument Mode
TEL.ROT.OFFANGLE	number	0.0			Rotator on Sky (=-PA on Sky)
TEL.TARG.TYPE	keyword	COORDINATE			Target type
TEL.TARG.WLENGTH	number	600			Telescope tracking wavelength

8.1.6 ESPRESSO_singleUHR_acq_sky

Keyword	Type	Value	Default	Range	Help
OCS.OBJ.BV	number		0.0		Object color index B-V
OCS.OBJ.MV	number		NODEFAULT		Object V mag
OCS.OBJ.RV	number		0.0	-100000..100000	Object Radial Velocity (km/s)
OCS.OBJ.SP.TYPE	string		G2		Object spectral type (e.g. G2)
OCS.OBJ.Z.EM	number		0.0		Object redshift from emission lines
SEQ.PRESET	boolean		T	T F	Preset flag
TEL.AG.GUIDESTAR	keyword		CATALOGUE	NONE SETUPFILE CATALOGUE	Telescope guide star selection
TEL.GS1.ALPHA	coord		0		RA of telescope guide star
TEL.GS1.DELTA	coord		0		DEC of telescope guide star
TEL.TARG.ADDVELALPHA	number		0.0		Differential tracking in RA
TEL.TARG.ADDVELDELTA	number		0.0		Differential tracking in DEC
TEL.TARG.ALPHA	coord		0		RA
TEL.TARG.DELTA	coord		-850000		DEC
TEL.TARG.EPOCH	number		2000	-2000..3000	Epoch
TEL.TARG.EQUINOX	number		2000	-2000..3000	Equinox
TEL.TARG.NAME	string		Generic		Name of the target
TEL.TARG.OFFSETALPHA	number		0.0		RA blind offset
TEL.TARG.OFFSETDELTA	number		0.0		DEC blind offset
TEL.TARG.PMA	number		0.0	-10..10	Proper Motion Alpha
TEL.TARG.PMD	number		0.0	-10..10	Proper Motion Delta

INS.CALSEL.NAME	keyword	TRG_SKY			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEUHR			Instrument Mode
TEL.ROT.OFFANGLE	number	0.0			Rotator on Sky (=-PA on Sky)
TEL.TARG.TYPE	keyword	COORDINATE			Target type
TEL.TARG.WLENGTH	number	600			Telescope tracking wavelength

8.2 Observation Templates

8.2.1 ESPRESSO_multiMR_obs

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
DET1.UIT1	number		1.0	0..36000	Exposure time
OCS.WAVECAL.SOURCE	keyword		NODEFAULT	THAR LFC	Calib. associated fibre A
SEQ.CALSOURCEB	keyword		NODEFAULT	DARK SKY THAR2 FPCS	Source on fibre B
SEQ.NO	integer		1	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	SCIENCE			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.MODE	keyword	MULTIMR			Instrument Mode
OCS.EM.TABLE	keyword	T			Save exposure meter count table
OCS.TCCD.FS.INTIM	keyword	T			Save integrated field image
SEQ.WAITFORUSER	keyword	F			Wait for user interaction before starting exposure

8.2.2 ESPRESSO_singleHR_obs

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
DET1.UIT1	number		1.0	0..36000	Exposure time
OCS.WAVECAL.SOURCE	keyword		NODEFAULT	THAR LFC	Calib. associated fibre A
SEQ.CALSOURCEB	keyword		NODEFAULT	DARK SKY THAR2 FPCS	Source on fibre B
SEQ.NO	integer		1	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	SCIENCE			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.MODE	keyword	SINGLEHR			Instrument Mode

OCS.EM.TABLE	keyword	T			Save exposure meter count table
OCS.TCCD.FS.INTIM	keyword	T			Save integrated field image
SEQ.WAITFORUSER	keyword	F			Wait for user interaction before starting exposure

8.2.3 ESPRESSO_singleUHR_obs

Keyword	Type	Value	Default	Range	Help
DET1.UIT1	number		1.0	0..36000	Exposure time
OCS.WAVECAL.SOURCE	keyword		NODEFAULT	THAR LFC	Calib. associated fibre A
SEQ.CALSOURCEB	keyword		NODEFAULT	DARK SKY THAR2 FPCS	Source on fibre B
SEQ.NO	integer		1	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	SCIENCE			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.MODE	keyword	SINGLEUHR			Instrument Mode
OCS.EM.TABLE	keyword	T			Save exposure meter count table
OCS.TCCD.FS.INTIM	keyword	T			Save integrated field image
SEQ.WAITFORUSER	keyword	F			Wait for user interaction before starting exposure

8.2.4 ESPRESSO_multiMR_obs_snr

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
OCS.WAVECAL.SOURCE	keyword		NODEFAULT	THAR1 THAR2 FPCS LFC	Calib. associated fibre A
SEQ.CALSOURCEB	keyword		NODEFAULT	DARK SKY THAR2 FPCS	Source on fibre B
SEQ.MAX.EXPTIME	number		3600.0	1..36000	Max. exposure time
SEQ.NO	integer		1	1..100000	Number of exposures
SEQ.SNR	number		100.0		Object SNR
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	SCIENCE			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.MODE	keyword	MULTIMR			Instrument Mode
OCS.EM.TABLE	keyword	T			Save exposure meter count table
OCS.TCCD.FS.INTIM	keyword	T			Save integrated field image

8.2.5 ESPRESSO_singleHR_obs_snr

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
OCS.WAVECAL.SOURCE	keyword		NODEFAULT	THAR1 THAR2 FPCS LFC	Calib. associated fibre A
SEQ.CALSOURCEB	keyword		NODEFAULT	DARK SKY THAR2 FPCS	Source on fibre B
SEQ.MAX.EXPTIME	number		3600.0	1..36000	Max. exposure time
SEQ.NO	integer		1	1..100000	Number of exposures
SEQ.SNR	number		100.0		Object SNR
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	SCIENCE			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.MODE	keyword	SINGLEHR			Instrument Mode
OCS.EM.TABLE	keyword	T			Save exposure meter count table
OCS.TCCD.FS.INTIM	keyword	T			Save integrated field image

8.2.6 ESPRESSO_singleUHR_obs_snr

Keyword	Type	Value	Default	Range	Help
OCS.WAVECAL.SOURCE	keyword		NODEFAULT	THAR1 THAR2 FPCS LFC	Calib. associated fibre A
SEQ.CALSOURCEB	keyword		NODEFAULT	DARK SKY THAR2 FPCS	Source on fibre B
SEQ.MAX.EXPTIME	number		3600.0	1..36000	Max. exposure time
SEQ.NO	integer		1	1..100000	Number of exposures
SEQ.SNR	number		100.0		Object SNR
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	SCIENCE			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.MODE	keyword	SINGLEUHR			Instrument Mode
OCS.EM.TABLE	keyword	T			Save exposure meter count table
OCS.TCCD.FS.INTIM	keyword	T			Save integrated field image

8.3 Calibration Templates

8.3.1 ESPRESSO_multiMR_cal_bias

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
SEQ.NO	integer		6	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	BIAS			CCD exposure type
DET1.UIT1	number	0.0			Exposure time
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	IMAGE			Data Prod. Tech.
DPR.TYPE	keyword	BIAS			Data Prod. Type
INS.MODE	keyword	MULTIMR			Instrument Mode

8.3.2 ESPRESSO_singleHR_cal_bias

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
SEQ.NO	integer		6	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	BIAS			CCD exposure type
DET1.UIT1	number	0.0			Exposure time
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	IMAGE			Data Prod. Tech.
DPR.TYPE	keyword	BIAS			Data Prod. Type
INS.MODE	keyword	SINGLEHR			Instrument Mode

8.3.3 ESPRESSO_singleUHR_cal_bias

Keyword	Type	Value	Default	Range	Help
SEQ.NO	integer		6	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	BIAS			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DET1.UIT1	number	0.0			Exposure time
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	IMAGE			Data Prod. Tech.
DPR.TYPE	keyword	BIAS			Data Prod. Type
INS.MODE	keyword	SINGLEUHR			Instrument Mode

8.3.4 ESPRESSO_multiMR_cal_cont

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
SEQ.CALSOURCEB	keyword		FPCS	THAR2 LFC FPCS	Lamp selector B
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	MULTIMR			Instrument Mode
SEQ.NO	integer	1			Number of exposures

8.3.5 ESPRESSO_singleHR_cal_cont

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
SEQ.CALSOURCEB	keyword		FPCS	THAR2 LFC FPCS	Lamp selector B
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEHR			Instrument Mode
SEQ.NO	integer	1			Number of exposures

8.3.6 ESPRESSO_singleUHR_cal_cont

Keyword	Type	Value	Default	Range	Help
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
SEQ.CALSOURCEB	keyword		FPCS	THAR2 LFC FPCS	Lamp selector B
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEUHR			Instrument Mode
SEQ.NO	integer	1			Number of exposures

8.3.7 ESPRESSO_singleHR_cal_cte

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
SEQ.CTE.NDFILT	string		1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0		ND filter values (sep. by blanks)
SEQ.NO	integer		2	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	CTE,FP,FP			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEHR			Instrument Mode
SEQ.CALSOURCE	keyword	FPCS			Calib. source selection

8.3.8 ESPRESSO_singleUHR_cal_cte

Keyword	Type	Value	Default	Range	Help
SEQ.CTE.NDFILT	string		1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0		ND filter values (sep. by blanks)
SEQ.NO	integer		2	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	CTE,FP,FP			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEUHR			Instrument Mode
SEQ.CALSOURCE	keyword	FPCS			Calib. source selection

8.3.9 ESPRESSO_multiMR_cal_dark

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
DET1.UIT1	number		3600.0	0..36000	Exposure time
SEQ.NO	integer		5	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	DARK			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	IMAGE			Data Prod. Tech.
DPR.TYPE	keyword	DARK			Data Prod. Type
INS.MODE	keyword	MULTIMR			Instrument Mode

8.3.10 ESPRESSO_singleHR_cal_dark

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
DET1.UIT1	number		3600.0	0..36000	Exposure time
SEQ.NO	integer		5	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	DARK			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	IMAGE			Data Prod. Tech.
DPR.TYPE	keyword	DARK			Data Prod. Type
INS.MODE	keyword	SINGLEHR			Instrument Mode

8.3.11 ESPRESSO_singleUHR_cal_dark

Keyword	Type	Value	Default	Range	Help
DET1.UIT1	number		3600.0	0..36000	Exposure time
SEQ.NO	integer		5	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	DARK			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	IMAGE			Data Prod. Tech.
DPR.TYPE	keyword	DARK			Data Prod. Type
INS.MODE	keyword	SINGLEUHR			Instrument Mode

8.3.12 ESPRESSO_multiMR_cal_ff

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTA.DEN	number		-1	-1.0..6.0	ND filter A density
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
SEQ.NO	integer		10	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	FLAT			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	MULTIMR			Instrument Mode

8.3.13 ESPRESSO_singleHR_cal_ff

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTA.DEN	number		-1	-1.0..6.0	ND filter A density
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
SEQ.NO	integer		10	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	FLAT			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEHR			Instrument Mode

8.3.14 ESPRESSO_singleUHR_cal_ff

Keyword	Type	Value	Default	Range	Help
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTA.DEN	number		-1	-1.0..6.0	ND filter A density
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
SEQ.NO	integer		10	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	FLAT			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEUHR			Instrument Mode

8.3.15 ESPRESSO_multiMR_cal_led

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
SEQ.MAX.EXPTIME	number		20	1..300	Maximum exposure time
SEQ.NO	integer		5	1..100000	Number of exposures
SEQ.NSTEPS	number		10	1..20	Number of steps
DET1.EXP.TYPE	keyword	LED			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	IMAGE			Data Prod. Tech.
DPR.TYPE	keyword	LED			Data Prod. Type
INS.MODE	keyword	MULTIMR			Instrument Mode

8.3.16 ESPRESSO_singleHR_cal_led

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
SEQ.MAX.EXPTIME	number		20	1..300	Maximum exposure time
SEQ.NO	integer		5	1..100000	Number of exposures
SEQ.NSTEPS	number		10	1..20	Number of steps
DET1.EXP.TYPE	keyword	LED			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	IMAGE			Data Prod. Tech.
DPR.TYPE	keyword	LED			Data Prod. Type
INS.MODE	keyword	SINGLEHR			Instrument Mode

8.3.17 ESPRESSO_singleUHR_cal_led

Keyword	Type	Value	Default	Range	Help
SEQ.MAX.EXPTIME	number		20	1..300	Maximum exposure time
SEQ.NO	integer		5	1..100000	Number of exposures
SEQ.NSTEPS	number		10	1..20	Number of steps
DET1.EXP.TYPE	keyword	LED			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	IMAGE			Data Prod. Tech.
DPR.TYPE	keyword	LED			Data Prod. Type
INS.MODE	keyword	SINGLEUHR			Instrument Mode

8.3.18 ESPRESSO_multiMR_cal_lin

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
SEQ.LIN.EXPTIMES	string		1 2 3		Exposure times (sep. by blanks)
SEQ.NO	integer		2	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	LINEARITY,FP,FP			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	MULTIMR			Instrument Mode
INS.VFILTA.DEN	number	0.0			ND filter A density
INS.VFILTB.DEN	number	0.0			ND filter B density
SEQ.CALSOURCE	keyword	FPCS			Calib. source selection

8.3.19 ESPRESSO_singleHR_cal_lin

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
SEQ.LIN.EXPTIMES	string		1 2 3		Exposure times (sep. by blanks)
SEQ.NO	integer		2	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	LINEARITY,FP,FP			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEHR			Instrument Mode
INS.VFILTA.DEN	number	0.0			ND filter A density
INS.VFILTB.DEN	number	0.0			ND filter B density
SEQ.CALSOURCE	keyword	FPCS			Calib. source selection

8.3.20 ESPRESSO_singleUHR_cal_lin

Keyword	Type	Value	Default	Range	Help
SEQ.LIN.EXPTIMES	string		1 2 3		Exposure times (sep. by blanks)
SEQ.NO	integer		2	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	LINEARITY,FP,FP			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEUHR			Instrument Mode
INS.VFILTA.DEN	number	0.0			ND filter A density
INS.VFILTB.DEN	number	0.0			ND filter B density
SEQ.CALSOURCE	keyword	FPCS			Calib. source selection

8.3.21 ESPRESSO_multiMR_cal_order

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTA.DEN	number		-1	-1.0..6.0	ND filter A density
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	ORDERDEF			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	MULTIMR			Instrument Mode
SEQ.NO	integer	1			Number of exposures

8.3.22 ESPRESSO_singleHR_cal_order

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTA.DEN	number		-1	-1.0..6.0	ND filter A density
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	ORDERDEF			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEHR			Instrument Mode
SEQ.NO	integer	1			Number of exposures

8.3.23 ESPRESSO_singleUHR_cal_order

Keyword	Type	Value	Default	Range	Help
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTA.DEN	number		-1	-1.0..6.0	ND filter A density
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	ORDERDEF			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEUHR			Instrument Mode
SEQ.NO	integer	1			Number of exposures

8.3.24 ESPRESSO_multiMR_cal_pix

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
DET1.UIT1	number		1.0	0..36000	Exposure time
SEQ.NO	integer		50	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	GEOMETRY,LFC,LFC			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	MULTIMR			Instrument Mode
INS.VFILTA.DEN	number	0.0			ND filter A density
INS.VFILTB.DEN	number	0.0			ND filter B density

8.3.25 ESPRESSO_singleHR_cal_pix

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
DET1.UIT1	number		1.0	0..36000	Exposure time
SEQ.NO	integer		50	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	GEOMETRY,LFC,LFC			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEHR			Instrument Mode
INS.VFILTA.DEN	number	0.0			ND filter A density
INS.VFILTB.DEN	number	0.0			ND filter B density

8.3.26 ESPRESSO_singleUHR_cal_pix

Keyword	Type	Value	Default	Range	Help
DET1.UIT1	number		1.0	0..36000	Exposure time
SEQ.NO	integer		50	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	GEOMETRY,LFC,LFC			Data Prod. Type
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEUHR			Instrument Mode
INS.VFILTA.DEN	number	0.0			ND filter A density
INS.VFILTB.DEN	number	0.0			ND filter B density

8.3.27 ESPRESSO_multiMR_cal_skyflat

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
DET1.UIT1	number		1.0	0..36000	Exposure time
SEQ.NO	integer		5	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	EFF,SKY,SKY			Data Prod. Type
INS.CALSEL.NAME	keyword	TRG_SKY			Instrument FE Calibration Injection Slide
INS.MODE	keyword	MULTIMR			Instrument Mode

8.3.28 ESPRESSO_singleHR_cal_skyflat

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
DET1.UIT1	number		1.0	0..36000	Exposure time
SEQ.NO	integer		5	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	EFF,SKY,SKY			Data Prod. Type
INS.CALSEL.NAME	keyword	TRG_SKY			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEHR			Instrument Mode

8.3.29 ESPRESSO_singleUHR_cal_skyflat

Keyword	Type	Value	Default	Range	Help
DET1.UIT1	number		1.0	0..36000	Exposure time
SEQ.NO	integer		5	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	EFF,SKY,SKY			Data Prod. Type
INS.CALSEL.NAME	keyword	TRG_SKY			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEUHR			Instrument Mode

8.3.30 ESPRESSO_multiMR_cal_std

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
DET1.UIT1	number		600.0	0..36000	Exposure time
SEQ.NO	integer		1	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	FLUX,STD,SKY			Data Prod. Type
INS.CALSEL.NAME	keyword	TRG_SKY			Instrument FE Calibration Injection Slide
INS.MODE	keyword	MULTIMR			Instrument Mode
OCS.EM.TABLE	keyword	T			Save exposure meter count table
OCS.TCCD.FS.INTIM	keyword	T			Save integrated field image

8.3.31 ESPRESSO_singleHR_cal_std

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
DET1.UIT1	number		600.0	0..36000	Exposure time
SEQ.NO	integer		1	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	FLUX,STD,SKY			Data Prod. Type
INS.CALSEL.NAME	keyword	TRG_SKY			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEHR			Instrument Mode
OCS.EM.TABLE	keyword	T			Save exposure meter count table
OCS.TCCD.FS.INTIM	keyword	T			Save integrated field image

8.3.32 ESPRESSO_singleUHR_cal_std

Keyword	Type	Value	Default	Range	Help
DET1.UIT1	number		600.0	0..36000	Exposure time
SEQ.NO	integer		1	1..100000	Number of exposures
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
DPR.TYPE	keyword	FLUX,STD,SKY			Data Prod. Type
INS.CALSEL.NAME	keyword	TRG_SKY			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEUHR			Instrument Mode
OCS.EM.TABLE	keyword	T			Save exposure meter count table
OCS.TCCD.FS.INTIM	keyword	T			Save integrated field image

8.3.33 ESPRESSO_multiMR_cal_wave

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		4x2_SLOW	4x2_SLOW 8x4_SLOW	Binning/Readout mode
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTA.DEN	number		-1	-1.0..6.0	ND filter A density
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
SEQ.NO	integer		1	1..100000	Number of exposures
SEQ.WAVE.LAMPSEL	keyword		NODEFAULT	THAR1_THAR1 THAR1_THAR2 THAR1_FP THAR1_LFC THAR2_THAR1 THAR2_THAR2 THAR2_FP THAR2_LFC FP_THAR1 FP_THAR2 FP_FP FP_LFC LFC_THAR1 LFC_THAR2 LFC_FP LFC_LFC	Lamp selection
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	MULTIMR			Instrument Mode

8.3.34 ESPRESSO_singleHR_cal_wave

Keyword	Type	Value	Default	Range	Help
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW	Binning/Readout mode
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTA.DEN	number		-1	-1.0..6.0	ND filter A density
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
SEQ.NO	integer		1	1..100000	Number of exposures
SEQ.WAVE.LAMPSEL	keyword		NODEFAULT	THAR1_THAR1 THAR1_THAR2 THAR1_FP THAR1_LFC THAR2_THAR1 THAR2_THAR2 THAR2_FP THAR2_LFC FP_THAR1 FP_THAR2 FP_FP FP_LFC LFC_THAR1 LFC_THAR2 LFC_FP LFC_LFC	Lamp selection
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEHR			Instrument Mode

8.3.35 ESPRESSO_singleUHR_cal_wave

Keyword	Type	Value	Default	Range	Help
DET1.UIT1	number		-1	-1.0..36000	Exposure time
INS.VFILTA.DEN	number		-1	-1.0..6.0	ND filter A density
INS.VFILTB.DEN	number		-1	-1.0..6.0	ND filter B density
SEQ.NO	integer		1	1..100000	Number of exposures
SEQ.WAVE.LAMPSEL	keyword		NODEFAULT	THAR1_THAR1 THAR1_THAR2 THAR1_FP THAR1_LFC THAR2_THAR1 THAR2_THAR2 THAR2_FP THAR2_LFC FP_THAR1 FP_THAR2 FP_FP FP_LFC LFC_THAR1 LFC_THAR2 LFC_FP LFC_LFC	Lamp selection
DET1.EXP.TYPE	keyword	NORMAL			CCD exposure type
DET1.MODE	keyword	1x1_FAST			Binning/Readout mode
DPR.CATG	keyword	CALIB			Data Prod. Cath.
DPR.TECH	keyword	ECHELLE			Data Prod. Tech.
INS.CALSEL.NAME	keyword	CALA_CALB			Instrument FE Calibration Injection Slide
INS.MODE	keyword	SINGLEUHR			Instrument Mode

8.4 Technical Templates

8.4.1 ESPRESSO_TEC_CTCalibFocus

Keyword	Type	Value	Default	Range	Help
SEQ.COMPUTE	string		T	T F	Perform computation
SEQ.EXPO.TIME	number		0.1	0.1..10	TCCD exposure time

SEQ.FILENAME	string		CTCalibFocus		File name
SEQ.FILTER	keyword		FSND00	FSND00 FSND10 FSND20 FSND30 FSND40	FE FS Filter
SEQ.FOCUS0	number		1	1..24	Focus start position
SEQ.FOCUS1	number		25	2..25	Focus end position
SEQ.FWHMGUESS	number		15	10..500	Initial guess for FWHM
SEQ.N_EXP	integer		20	2..1000	Number of exposures
SEQ.PEAKNO	integer		1	1..40	Number of peaks to find
SEQ.PIEZO_X	integer		16383	0..32767	Piezo X position
SEQ.PIEZO_Y	integer		16383	0..32767	Piezo Y position
SEQ.TCCD	keyword		FS1	FS1 FS2 FS3 FS4	Technical CCD

8.4.2 ESPRESSO_TEC_EMFocus

Keyword	Type	Value	Default	Range	Help
INS.FILT2.NAME	keyword		EMND00	EMND00 EMND10 EMND15 EMND20 EMND30	EM Filter
SEQ.EXPO.TIME	number		0.1	0.1..10	Start X
SEQ.FILENAME	string		EMFocus		File name
SEQ.FOCUS0	number		1	1..24	Focus start position
SEQ.FOCUS1	number		25	2..25	Focus end position
SEQ.N_EXP	integer		20	2..1000	Number of exposures

8.4.3 ESPRESSO_TEC_FECalibFilter

Keyword	Type	Value	Default	Range	Help
SEQ.COMPUTE	string		T	T F	Perform computation
SEQ.EXPO.TIME	number		0.1	0.1..10	TCCD exposure time
SEQ.FILENAME	string		FECalibFilter		File name
SEQ.FILTER0	number		0	0..359	Filter start position (deg)
SEQ.FILTER1	number		360	1..360	Filter end position (deg)
SEQ.FOCUS	number		14	1..24	Focus position
SEQ.N_EXP	integer		20	2..1000	Number of exposures
SEQ.PIEZO_X	integer		16383	0..32767	Piezo X position
SEQ.PIEZO_Y	integer		16383	0..32767	Piezo Y position
SEQ.TCCD	keyword		FS1	PS1 PS2 PS3 PS4 FS1 FS2 FS3 FS4	Technical CCD

8.4.4 ESPRESSO_TEC_FECalibFocus

Keyword	Type	Value	Default	Range	Help
SEQ.COMPUTE	string		T	T F	Perform computation
SEQ.EXPO.TIME	number		0.1	0.1..10	TCCD exposure time
SEQ.FILENAME	string		FECalibFocus		File name
SEQ.FILTER	keyword		FSND00	FSND00 FSND10 FSND20 FSND30 FSND40	FE FS Filter
SEQ.FOCUS0	number		1	1..24	Focus start position
SEQ.FOCUS1	number		25	2..25	Focus end position
SEQ.N_EXP	integer		20	2..1000	Number of exposures
SEQ.PIEZO_X	integer		16383	0..32767	Piezo X position
SEQ.PIEZO_Y	integer		16383	0..32767	Piezo Y position
SEQ.TCCD	keyword		FS1	FS1 FS2 FS3 FS4	Technical CCD

8.4.5 ESPRESSO_TEC_FECalibPiezo

Keyword	Type	Value	Default	Range	Help
SEQ.COMPUTE	string		T	T F	Perform computation
SEQ.EXPO.TIME	number		0.1	0.1..10	TCCD exposure time
SEQ.FILENAME	string		FECalibPiezo		File name
SEQ.FILTER	keyword		FSND00	FSND00 FSND10 FSND20 FSND30 FSND40	FE FS Filter
SEQ.FOCUS	number		14	1..24	Focus position
SEQ.N_EXP	integer		20	2..1000	Number of exposures
SEQ.PIEZO_X0	integer		0	0..32766	Piezo start X
SEQ.PIEZO_X1	integer		32767	0..32767	Piezo end X
SEQ.PIEZO_Y0	integer		0	0..32766	Piezo start Y
SEQ.PIEZO_Y1	integer		32767	0..32767	Piezo end Y
SEQ.TCCD	keyword		FS1	PS1 PS2 PS3 PS4 FS1 FS2 FS3 FS4	Technical CCD

8.4.6 ESPRESSO_TEC_preflash

Keyword	Type	Value	Default	Range	Help
DET1.EXP.TYPE	keyword		LedShut	Normal Bias Dark Flat Led LedShut Multiple	CCD exposure type
DET1.MODE	keyword		1x1_FAST	1x1_FAST 2x1_SLOW 4x2_SLOW 8x4_SLOW	Binning/Readout mode
DET1.PFLASH1.EXPTIME	number		1.2	0..1000	Preflash exposure time
DPR.CATG	keyword		CALIB	CALIB NORMAL	Data Prod. Cath.
DPR.TECH	keyword		IMAGE	ECHELLE	Data Prod. Tech.
INS.MODE	keyword		SINGLEHR	SINGLEHR SINGLEUHR MULTIMR	Instrument Mode
INS.SHUSEL.CFG	keyword		HR	NONE HR UHR MR HRUHR HRMR UHRMR HRUHRMR	Shutter selector
INS.SHUSEL.MODE	keyword		OPER	OPER MAINT	Shutter operational mode
SEQ.NO	integer		1	1..500	Number of repeated exposures

8.4.7 ESPRESSO_TEC_TelescopeFocus

Keyword	Type	Value	Default	Range	Help
SEQ.EXPO.TIME	number		0.1	0.1..10	Start X
SEQ.FILENAME	string		TelescopeFocus		File name
SEQ.FOCUS_0	number		0	0..9	Telescope start focus
SEQ.FOCUS_1	number		10	1..10	Telescope end focus
SEQ.FRONTEND	integer		1	1..4	Front end
SEQ.N_EXP	integer		20	2..1000	Number of exposures

8.4.8 ESPRESSO_TEC_WobbleAz

Keyword	Type	Value	Default	Range	Help
SEQ.ALT	number		45	0..90	Telescope altitude
SEQ.AZ_0	number		0	0..358	Telescope start azimuth
SEQ.AZ_1	number		359	1..359	Telescope end azimuth
SEQ.COMPUTE	string		T	T F	Perform computation
SEQ.EXPTIME_FS	number		0.1	0.1..10	Field TCCD exposure time
SEQ.EXPTIME_PS	number		0.1	0.1..10	Pupil TCCD exposure time
SEQ.FILENAME	string		WobbleAz		File name
SEQ.FRONTEND	integer		1	1..4	Front end
SEQ.N_EXP	integer		20	2..1000	Number of exposures
SEQ.USE_FS	string		T	T F	Use field TCCD
SEQ.USE_PS	string		T	T F	Use pupil TCCD

9 DPR Keywords

The following table lists the values of the DPR keywords, set by the templates to provide a link to the instrument DRS.

TPL	DCATG	DTECH	DTYPE
ESPRESSO_<mode>_cal_bias	CALIB	IMAGE	BIAS
ESPRESSO_<mode>_cal_cont	CALIB	ECHELLE	CONTAM,OFF,FP CONTAM,OFF,LFC CONTAM,OFF,THAR
ESPRESSO_<mode>_cal_std	CALIB	ECHELLE	CTE,FP,FP
ESPRESSO_<mode>_cal_dark	CALIB	IMAGE	DARK
ESPRESSO_<mode>_cal_ff	CALIB	ECHELLE	FLAT,LAMP,OFF FLAT, OFF,LAMP
ESPRESSO_<mode>_cal_led	CALIB	IMAGE	LED
ESPRESSO_<mode>_cal_lin	CALIB	ECHELLE	LINEARITY,FP,FP
ESPRESSO_<mode>_cal_order	CALIB	ECHELLE	ORDERDEF,LAMP,OFF ORDERDEF, OFF,LAMP
ESPRESSO_<mode>_cal_pix	CALIB	ECHELLE	GEOMETRY,LFC,LFC
ESPRESSO_<mode>_cal_skyflat	CALIB	ECHELLE	EFF,SKY,SKY
ESPRESSO_<mode>_cal_std	CALIB	ECHELLE	FLUX,STD,SKY
ESPRESSO_<mode>_cal_wave	CALIB	ECHELLE	WAVE,THAR,THAR WAVE,THAR,FP WAVE,THAR,LFC WAVE,LFC,THAR WAVE,LFC,FP WAVE,LFC,LFC WAVE,FP,FP
ESPRESSO_<mode>_obs	SCIENCE	ECHELLE	OBJECT,SKY OBJECT,THAR OBJECT,LFC

			OBJECT,FP

Table 2: DPR keywords