Observation Preparation: ETC, P2, OBs

La Silla Observing School 2026

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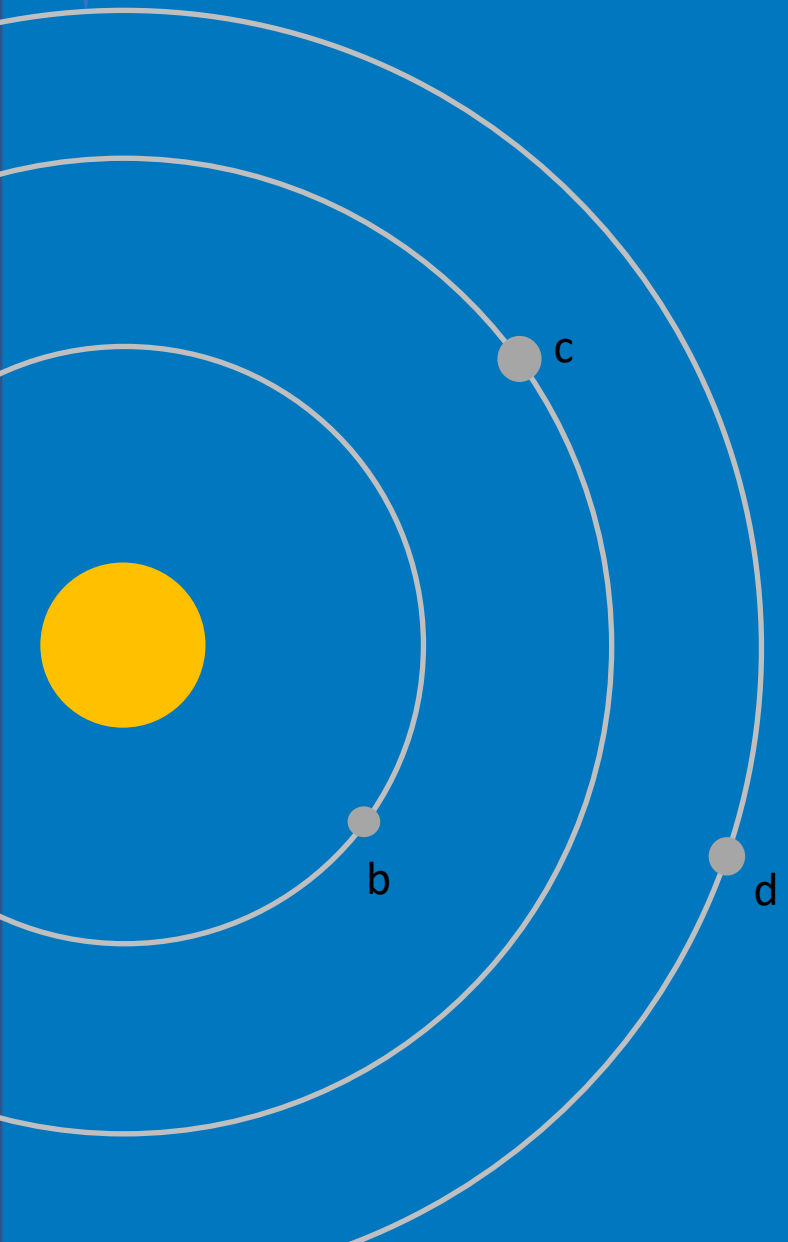
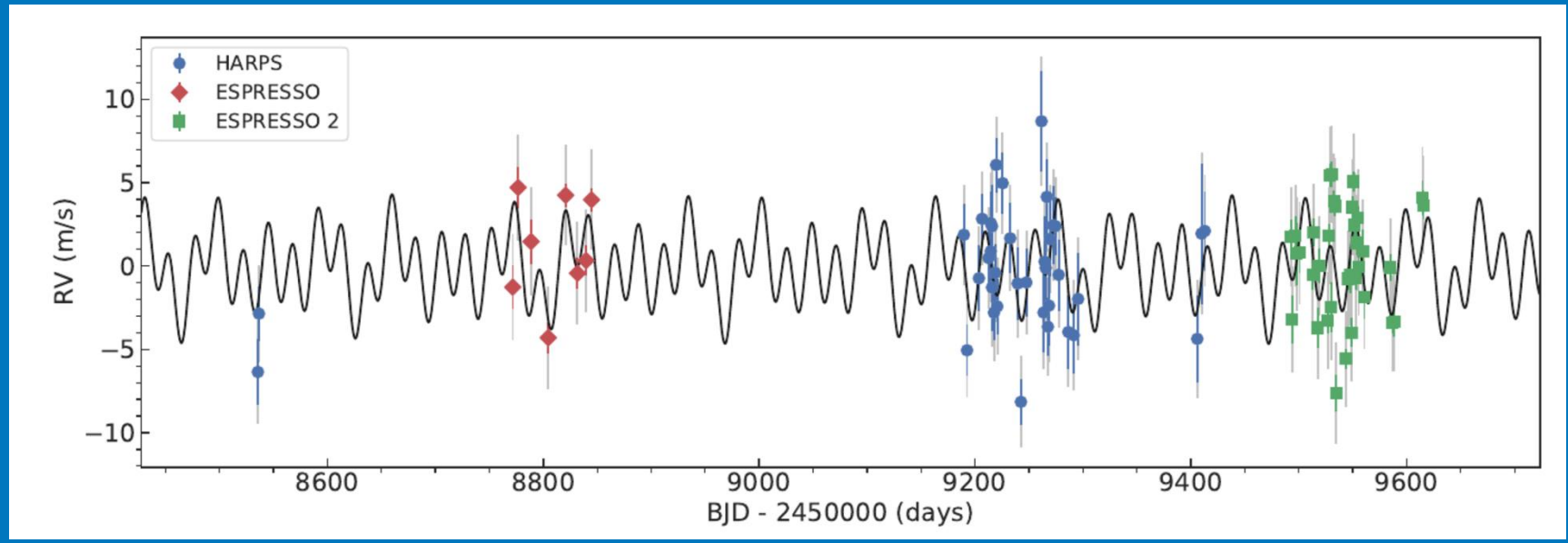
A dance of three (sub)-Neptunes



Planet	Orbital Period (days)	Radius (Earth)	Mass (Earth)	Density
TOI-282 **b**	22.891 (0.0004)	2.2 (0.1)	**6.2 (1.6)**	**like Neptune**
TOI-282 **c**	56.008 (0.002)	4.2 (0.11)	**9.2 (2.0)**	**like Saturn**
TOI-282 **d**	84.26 (0.007)	3.3 (0.11)	**5.8 (1.0)**	**like Saturn**



Planning the experiment (= the observations)

So, you have an idea ...

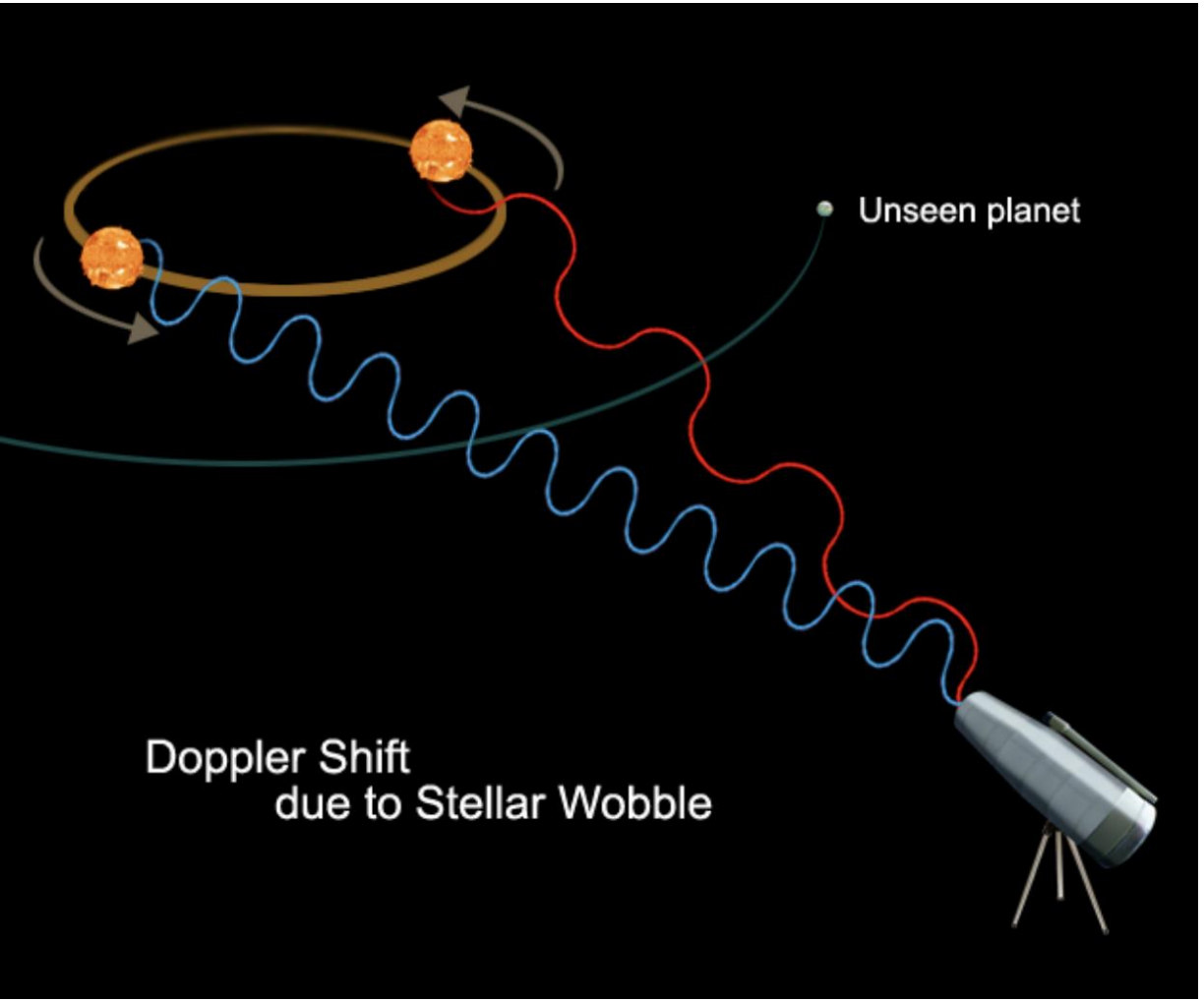
What measurements are needed to achieve the science goal?

Is the idea feasible?

Observation preparation starts when applying for telescope time

- What instruments can provide the measurements?
- When is the target observable?
- How much observing time is needed?
- What observing conditions are needed?

What telescope & instrument can provide the measurement?



- **Radial velocity measurements?**

→ What RV precision is needed?

→ High-resolution spectrograph

→ Wavelength range?

Where is the object bright and exhibits a large number of spectral features?

What telescope & instrument can provide the measurement?

- **Imaging?**

→ What angular resolution on sky do you need?

Wide field vs narrow field?

Atmospheric turbulence correction (adaptive optics / AO)?

→ Wavelength range?

UV, optical, infrared?

What telescope & instrument can provide the measurement?

→ Instrument website for La Silla

https://www.eso.org/sci/facilities/lasilla/instruments.html

→ Read the User Manual of the instrument to be used

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When is the target observable?

Staralt: https://astro.ing.iac.es/staralt/

Skycalc:
https://www.eso.org/observing/etc/bin/gen/form?INS.MODE=swspectr+INS.NAME=SKYCALC

Simbad provides target information, incl. coordinates:

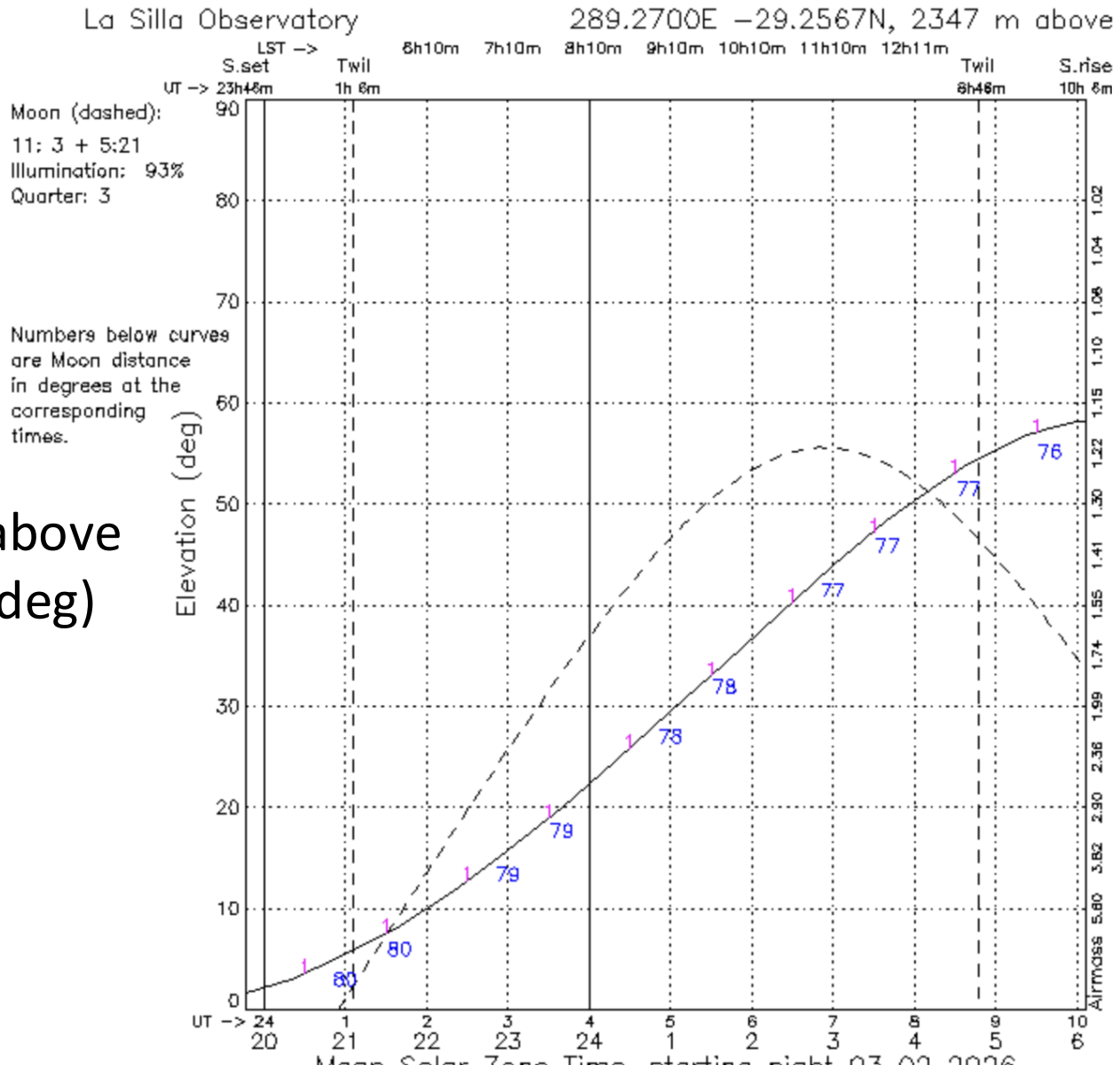
https://simbad.cds.unistra.fr/simbad/

When is the target observable?

Mode	Staralt
Night	03 February 2026 or date when the local night starts. Staralt, Startrack only.
Observatory	La Silla Observatory (Chile) Select one above or specify your own site with this format: `Longitude(°E) Latitude(°N) Altitude(metres) UT-offset(hours)` Ex.: `289.2767 -30.2283 2725 -4`

Coordinates	Formats can be any of these:
	`name hh mm ss ±dd mm ss`
	`name hh:mm:ss ±dd:mm:ss`
	`name ddd.ddd dd.ddd`
	name must be a single word with no dots, avoid using single numbers. Every entry must be in the same format, do not use different formats with different entries. We recommmend a maximum of 100 targets per submission.
	`14 39 36.49400 -60 50 02.3737`

When is the target observable?



altitude above horizon (deg)

X = 1.0, corresponds to zenith

airmass (X)

X = 1.1, corresponds to 65 deg altitude

X = 1.3, corresponds to 50 deg altitude

X = 2.0, corresponds to 30 deg altitude

When is the target observable?

Tips and tricks:

- Try to observe targets when they culminate (= around the lowest possible airmass)
  → less impact from our atmosphere, more flux, ...
- When observing many targets, plan ahead so that the telescope is never idle
- Avoid observations at high airmass (e.g. X > 2) as the impact from the atmosphere will be strong (lots of turbulence, less flux)
- Check the telescope limits (some telescopes do not allow observations at the zenith)

Observation preparation starts when applying for telescope time

- What instruments can provide the measurements?
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How much observing time is needed?

→ Exposure Time Calculators

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

- ETCs allow to simulate observations for atmospheric & sky conditions
- They allow to find the optimum setup for the observations
- Telescope time is precious!

ESO Exposure Time Calculators

Facility	Imaging	Spectroscopy
La Silla	EFOSC2, SUSI, WFI	EFOSC2, HARPS, NIRPS
Paranal UT1	FORS2 (old ETC)	FORS2 (old ETC), KMOS
	FORS2 (new ETC)	
Paranal UT2	VISIR	UVES (new ETC), UVES (old ETC), UVES-FLAMES, GIRAFFE, VISIR
Paranal UT3	SPHERE-IRDIS, SPHERE-ZIMPOL	X-SHOOTER, SPHERE-IFS, CRIRES
Paranal UT4	HAWK-I	MUSE
	ERIS	
Paranal ICCF		ESPRESSO
Paranal VLTI	GRAVITY, MATISSE	VisCalc, CalVin

Exposure Time Calculators: EFOSC (1)

Target Input Flux Distribution

spectral type*

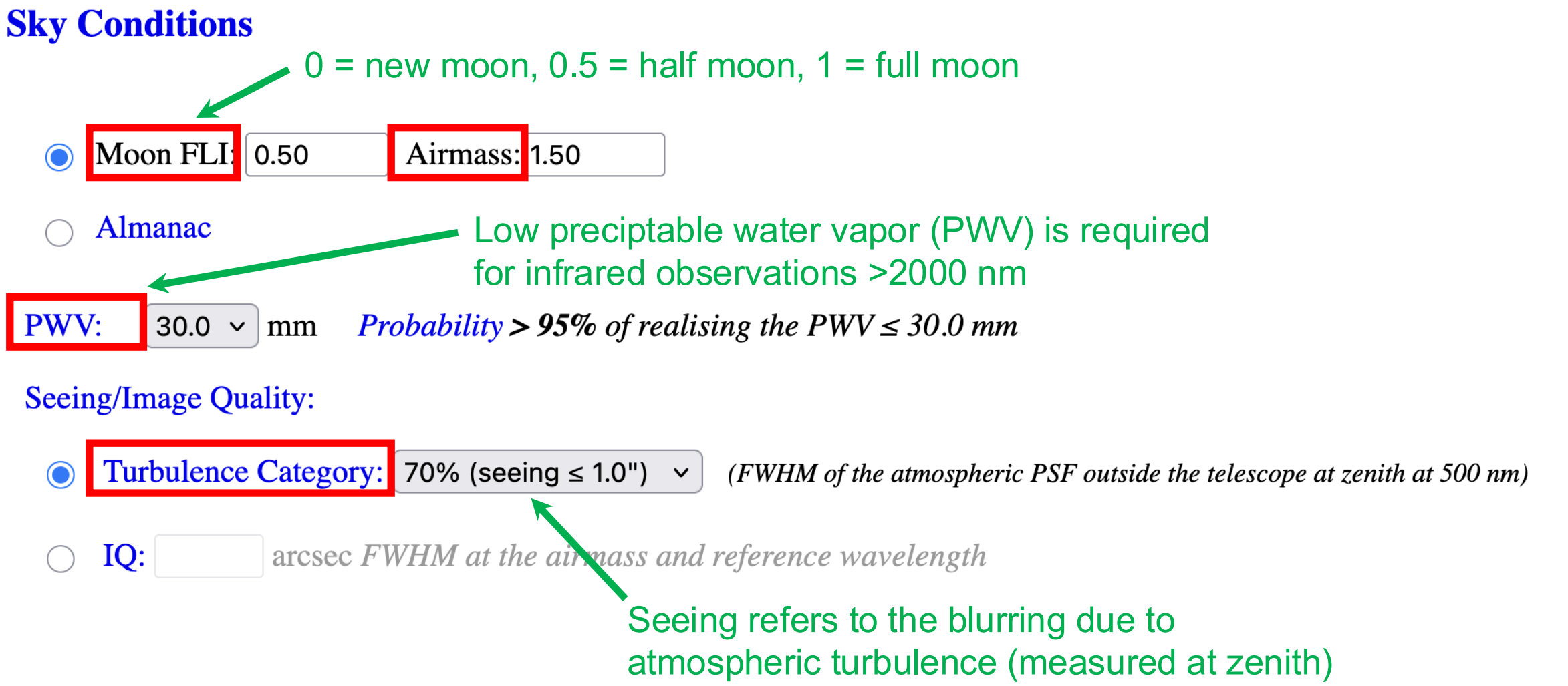
◉ Template Spectrum	G2V (Kurucz)	Redshift z = 0.00	Target Magnitude and Mag.System: V = 10.00 ◉ Vega ○ AB
○ MARCS Stellar Model	Teff=4000 log(g)=-0.5 [Fe/H]= 0 M= 1		
○ Upload Spectrum	Select...		
○ Blackbody	Temperature: K		*Magnitudes are given per arcsec^2 for extended sources*
○ Power Law	Index: $F(\lambda) \propto \lambda^{index}$		
○ Emission Line	Lambda: nm Flux: 10^{-16} ergs/s/cm^2 *(per arcsec^2 for extended sources)* FWHM: nm		

wavelength band*

Spatial Distribution: ◉ Point Source ○ Extended Source

*Target information: https://simbad.cds.unistra.fr/simbad/

Exposure Time Calculators: EFOSC (2)



Exposure Time Calculators: EFOSC (3)

The instrument's **User Manual** contains all relevant information (e.g., wavelength range & spectral resolving power of grisms, detector readout times)

Instrumental Setup

Slit width: 1.0"

Grism: Grism 2

Detector: CCD#40 Readout mode: normal Binning: 2x2 (spectral)×(spatial)

Polarimetry Mode: ◉ No polarimetry ○ Linear polarisation

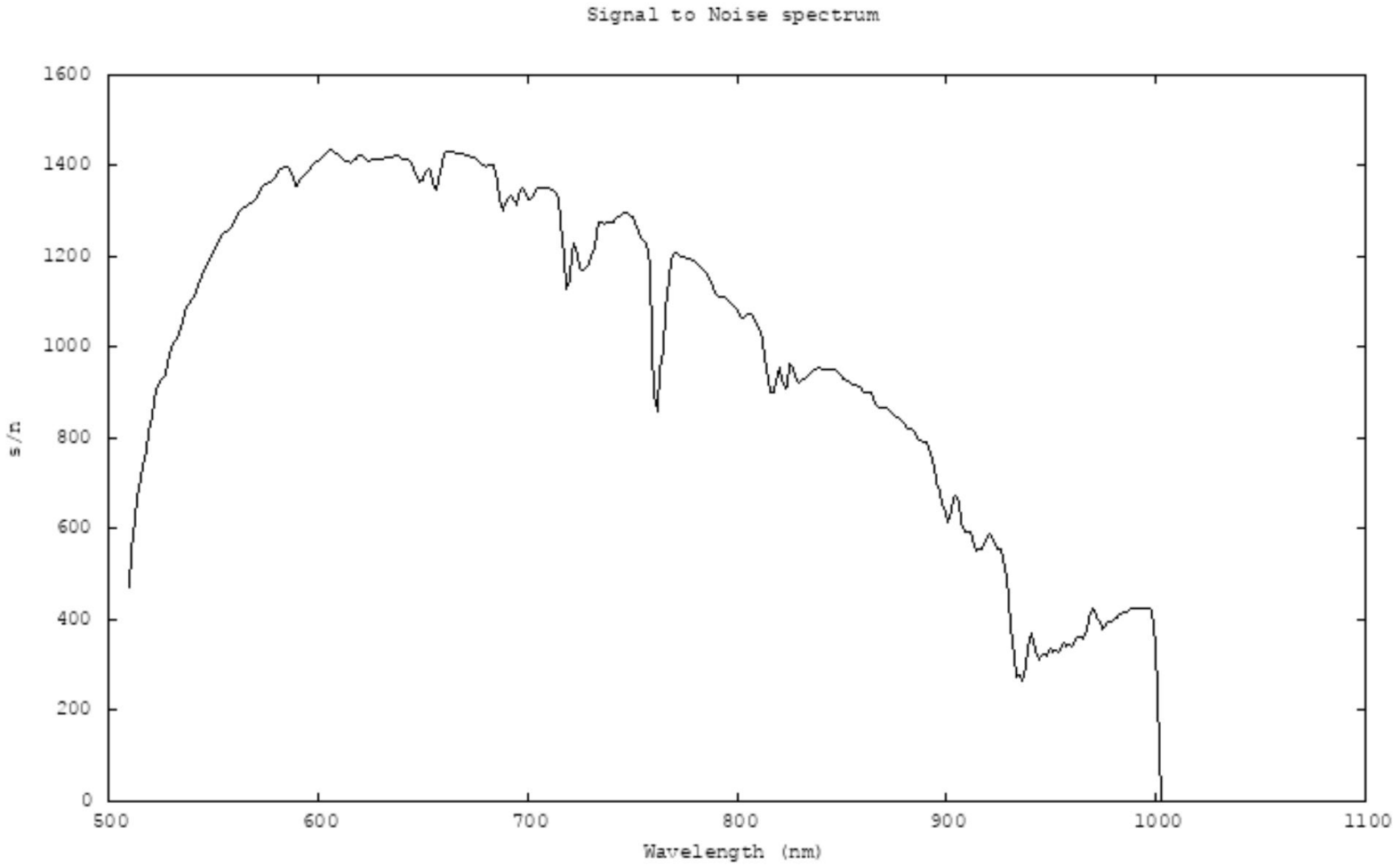
Results

○ S/N:

◉ Exposure Time: 100.0 s

Exposure Time Calculators: EFOSC - output

Output shows the signal-to-noise ratio (S/N):



Signal-to-noise ratio (S/N)

low S/N

high S/N

Signal-to-noise ratio (S/N)

The **Signal (S)** is the number of photons from an object that are recorded by the detector and converted into electrons

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The **Noise (N)** is the random contribution from various sources that affect the measurement of the signal, typically:

- **Photon noise** (shot noise) is the randomness in signal caused by the arrival of photons at the detector, due to the quantum nature of light. $N_{phot} = \sqrt{S}$

→ **If you want to double the S/N, you have to observe ~4 times longer ... (or go to a telescope ~twice as big in radius)**

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- **Photon noise** (shot noise) is the randomness in signal caused by the arrival of photons at the detector, due to the quantum nature of light. $N_{phot} = \sqrt{S}$
- **Background noise** due to sky brightness and thermal background of instrument, and detector (dark noise)
- **Read-out noise** (RON) when reading the detector

The ESO archive as an observation preparation guide

Within the ESO archive, you can locate observations similar to the ones you are planning, download them and analyse them ...

This can be very useful if you have never used the instrument before

ESO archive:
https://archive.eso.org/eso/eso_archive_main.html

Congratulations, you have been awarded telescope time!

Part II: **Creating the observations**

Observing Blocks

All ESO telescopes are operated through Observing Blocks (OBs)

Each OB is an observation unit, created by the users, that contains the ...

- target information and acquisition,
- observation description (instrument configuration, exposure time),
- finding charts (if needed),
- observing conditions and time-constraints (for service mode).

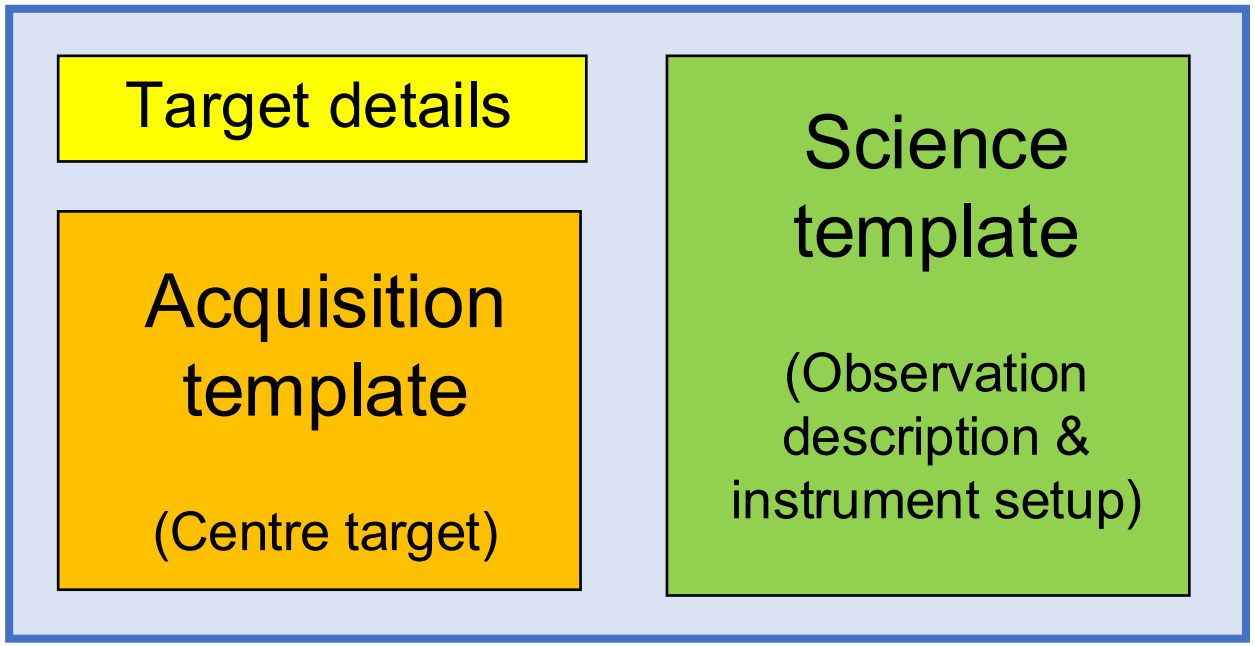
OBs are handled through ESO's Phase2 (p2) webpage ...

- for Paranal: https://www.eso.org/p2
- **for La Silla:** https://www.eso.org/p2ls

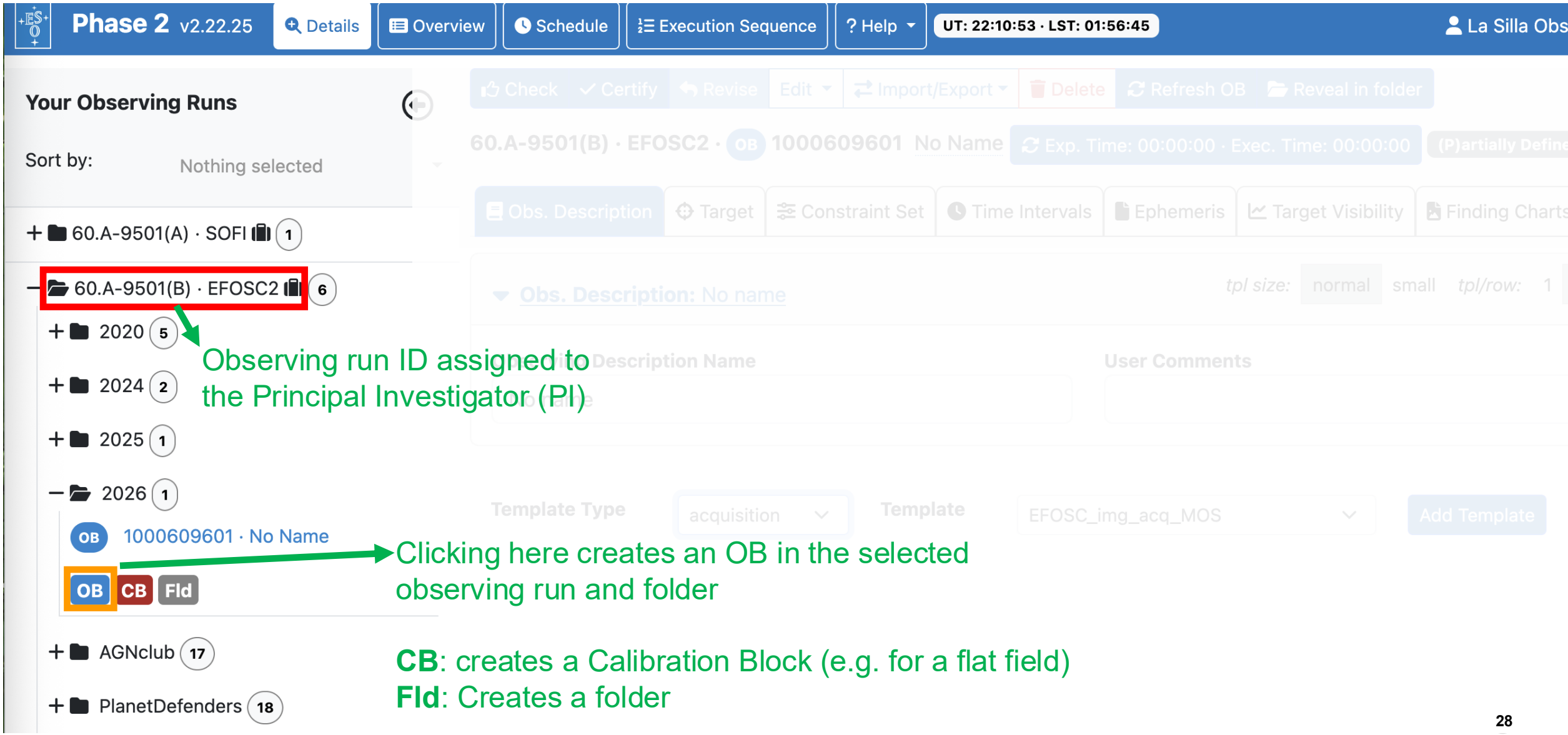
Observing Blocks

OBs are built using purpose-specific templates

- Each ESO instrument has its own set of templates
- Templates can be for target acquisition, for science observations, for calibration
- Example of a simple OB:



(1) Observing Blocks – creating an OB in p2

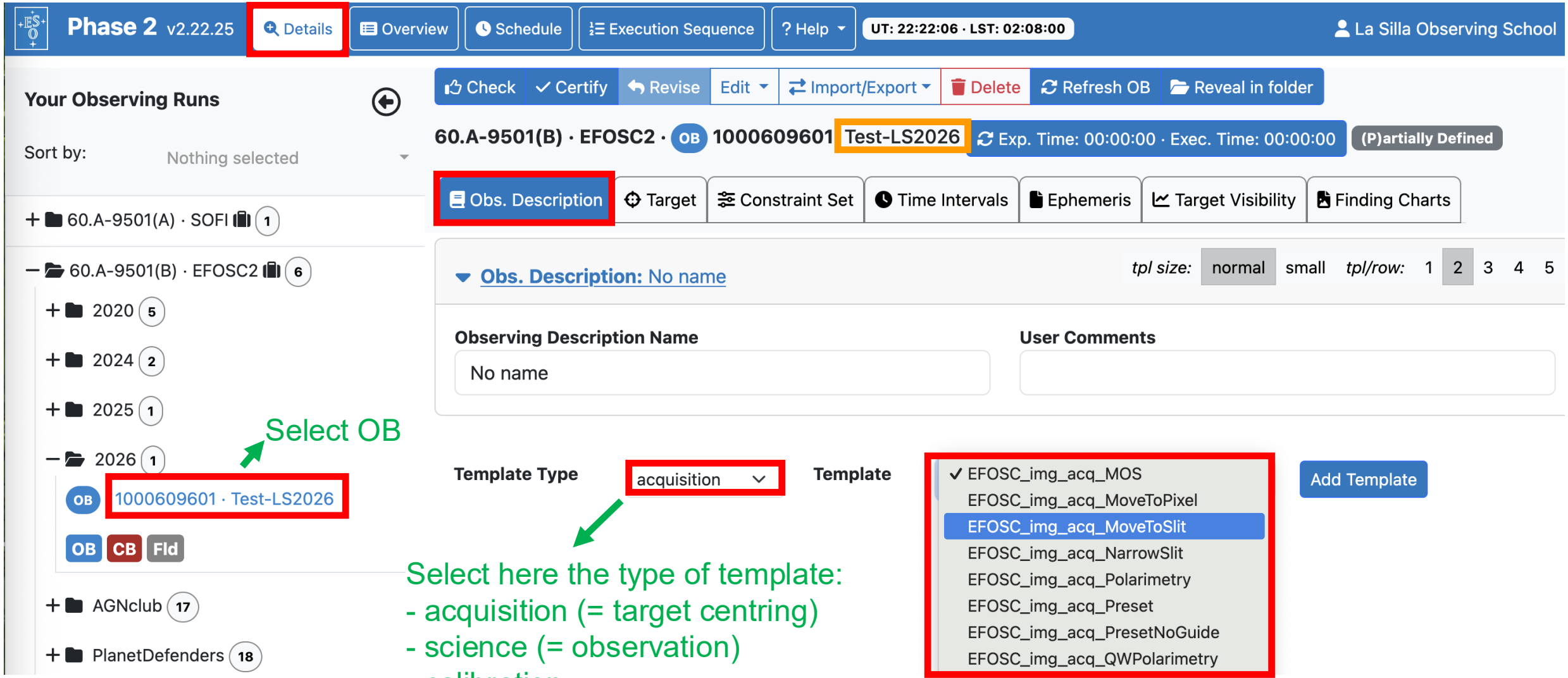


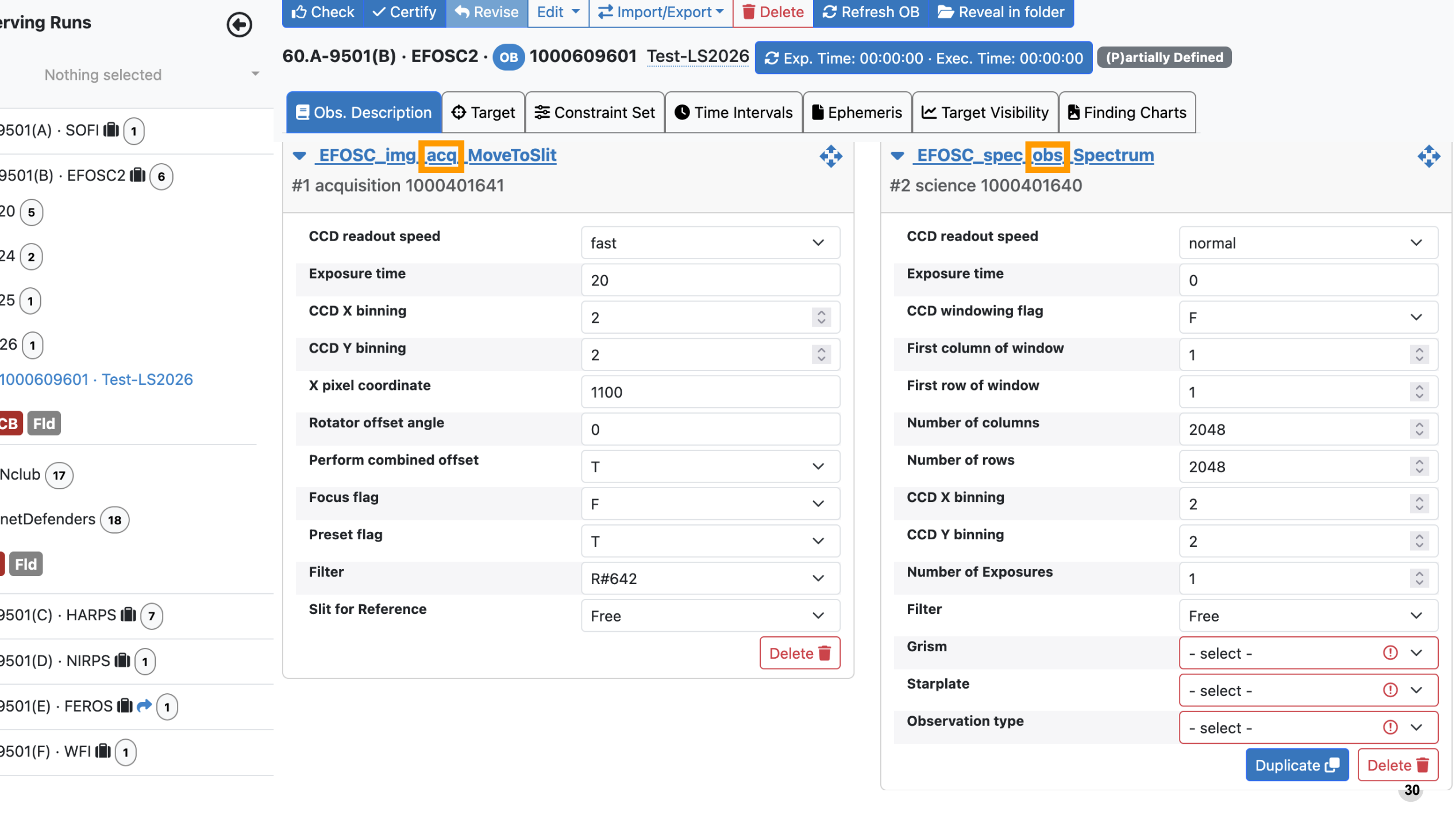
Observing run ID assigned to the Principal Investigator (PI)

Clicking here creates an OB in the selected observing run and folder

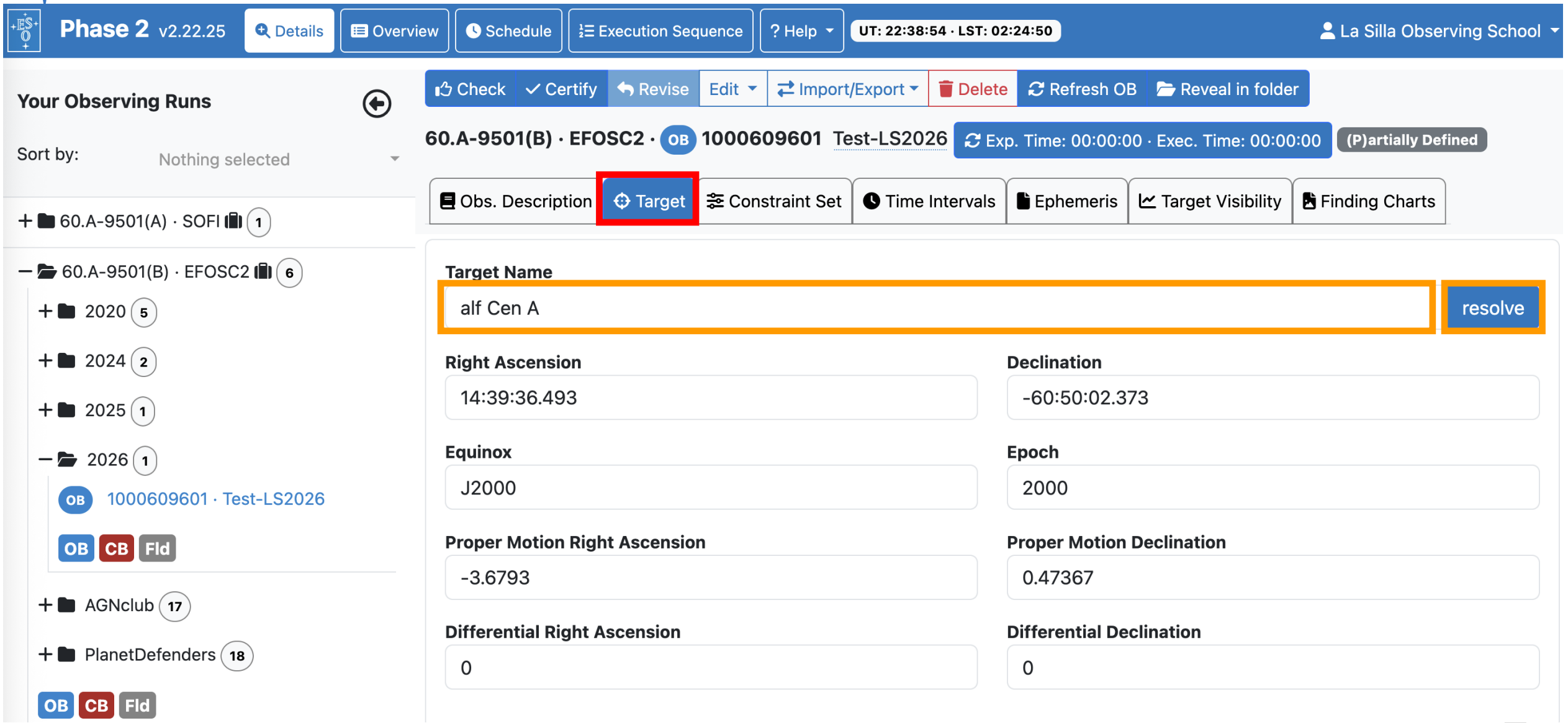
CB: creates a Calibration Block (e.g. for a flat field)
Fld: Creates a folder

(2) Observing Blocks – specifying the acquisition and observing templates

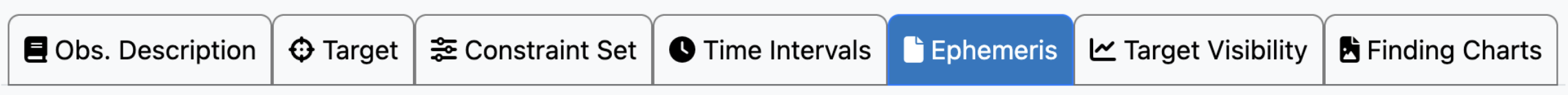



erving Runs
Nothing selected
9501(A) · SOFI 1
9501(B) · EFOSC2 6
20 5
24 2
25 1
26 1
1000609601 · Test-LS2026
CB Fld
Nclub 17
netDefenders 18
Fld
9501(C) · HARPS 7
9501(D) · NIRPS 1
9501(E) · FEROS 1
9501(F) · WFI 1
Check
Certify
Revise
Edit
Import/Export
Delete
Refresh OB
Reveal in folder
60.A-9501(B) · EFOSC2 · OB 1000609601 Test-LS2026
Exp. Time: 00:00:00 · Exec. Time: 00:00:00
(P)artially Defined
Obs. Description
Target
Constraint Set
Time Intervals
Ephemeris
Target Visibility
Finding Charts
EFOSC_img_acq_MoveToSlit
#1 acquisition 1000401641
CCD readout speed fast
Exposure time 20
CCD X binning 2
CCD Y binning 2
X pixel coordinate 1100
Rotator offset angle 0
Perform combined offset T
Focus flag F
Preset flag T
Filter R#642
Slit for Reference Free
Delete
EFOSC_spec_obs_Spectrum
#2 science 1000401640
CCD readout speed normal
Exposure time 0
CCD windowing flag F
First column of window 1
First row of window 1
Number of columns 2048
Number of rows 2048
CCD X binning 2
CCD Y binning 2
Number of Exposures 1
Filter Free
Grism - select -
Starplate - select -
Observation type - select -
Duplicate
Delete
30

(3a) Observing Blocks – specifying the target details



(3b) Observing Blocks – moving targets



For targets with quickly changing coordinates, there is no need to fill in the coordinates in the ‘Target’ tab.

Instead, a PAF file must be attached in the ‘Ephemeris’ tab that contains the ephemeris of the moving target.

PAF files can be created via this webpage:

https://www.eso.org/sci/observing/phase2/SMSpecial/MovingTargets.html#par_javascript

(4) Observing Blocks – features for service mode observations

‘**Constraint Set**’ tab: specify here the worst possible observing conditions under which the OB can be executed (and still be scientifically useful)

‘**Time Intervals**’ tab: specify here observing windows for time-critical OBs or observing sequences (e.g., observe my target every 3 days)

‘**Finding Charts**’ tab: attach a finding chart so that the night crew observes the correct target

(5) Observing Blocks – finish: check and certify the OB

Phase 2 v2.22.25 | Details | Overview | Schedule | Execution Sequence | ? Help | UT: 15:06:15 · LST: 18:54:54 | La Silla Observing School

Your Observing Runs

Sort by: Nothing selected

- + 60.A-9501(A) · SOFI (1)
- − 60.A-9501(B) · EFOSC2 (6)
  - + 2020 (5)
  - + 2024 (2)
  - + 2025 (1)
  - − 2026 (1)
    - OB 1000609601 · Test-LS2026
    - OB CB Fld
  - + AGNclub (17)
  - + PlanetDefenders (18)
  - OB CB Fld

Check | Certify | Revise | Edit | Import/Export | Delete | Refresh OB | Reveal in folder

60.A-9501(B) · EFOSC2 · OB 1000609601 Test-LS2026 Exp. Time: 00:01:40 | Exec. Time: 00:08:27 | (+) Accepted

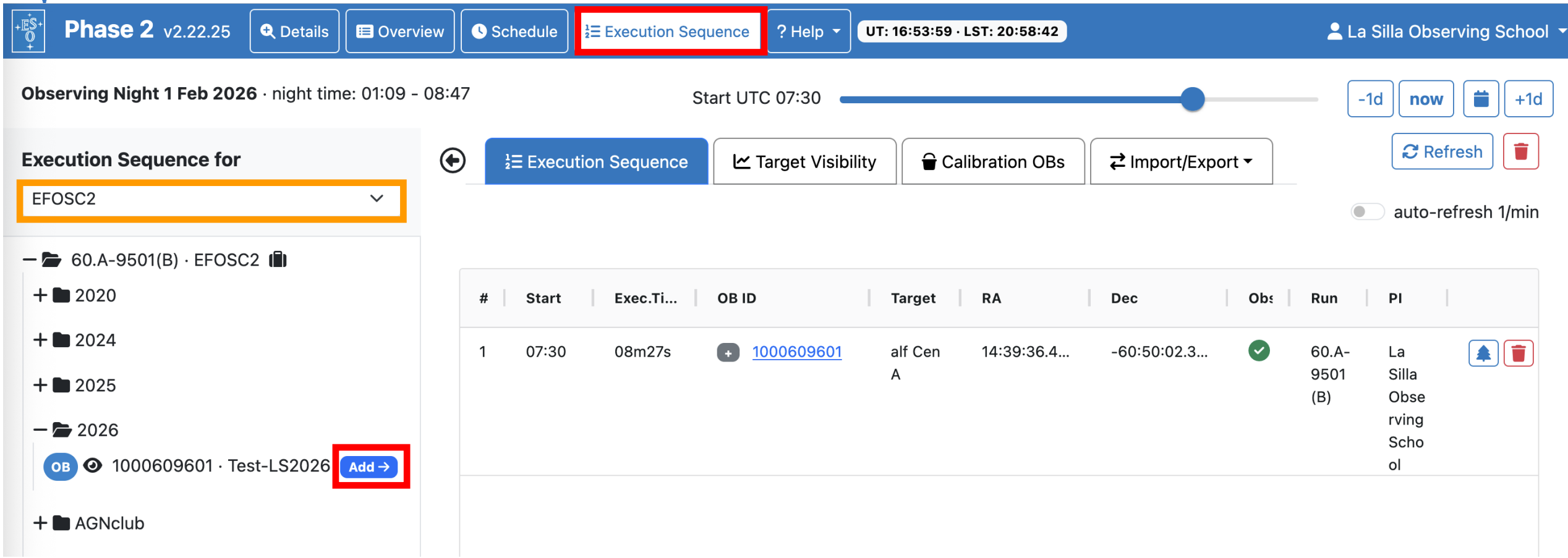
Obs. Description | Target | Constraint Set | Time Intervals | Ephemeris | Target Visibility | Finding Charts

Target Name

alf Cen A — resolve

Right Ascension	Declination
14:39:36.493	-60:50:02.373
Equinox	**Epoch**
J2000	2000
Proper Motion Right Ascension	**Proper Motion Declination**
-3.6793	0.47367
Differential Right Ascension	**Differential Declination**
0	0

(6) Observing Blocks – Visitor Mode – Execution Sequence



Important: Whenever you modify the execution sequence during the observations, inform the telescope operator about it so that they refresh it on their side.

Some final tips...

- Plan your observations well (telescope time is valuable)
- Have your target list and the time when you will observe them
- Give yourself time to adapt to night schedule (sleep well)
- Think ahead about everything that is predictable (you will have to deal with unexpected things, and you will be tired)
- Have contingency plans for bad weather conditions, pointing restrictions – have a plan B (e.g. backup targets)
- Familiarise yourself with the tools you will be using
- Have your instrument setup and Observing Blocks ready

Good luck with your observations!