Introduction to observation preparation

Fernando Comerón (ESO)
Observation preparation starts with the preparation of the proposal:

- Is the idea feasible?
- What telescope should I use?
- Which instrument? With which setup?
- How much time to apply for?
- What should be my targets?
- Service or visitor mode?
- What time of the year?
- Etc…
Congratulations! You got the observing time

- Do Not Improvise!
- Time at the telescope is valuable
- You will arrive tired after long trip
- You have long nights ahead and it will be hard to stay awake at 4am
- Altitude may have an effect on you
- The unexpected will happen, so reserve as much time as possible to deal with it
- You will have things to do in real time (doing quick-data reduction, checking quality, making sense out of the results, figuring out what went wrong…).
- So, *think ahead about everything that is predictable.*
Some tips to prepare in advance

- Have your target list and the time when you will observe each target (don’t chase them near the horizon if you can avoid it, don’t run out of targets because some have set and others are not up yet).
- Have finding charts if needed.
- Have contingency plans for bad seeing, non-photometric conditions if you need them.
- Have a backup program if possible.
- Familiarize yourself with the tools that you will be using.
- Make sure that you have enough disk space in your laptop.
- Think before arriving at the telescope everything that can be thought in advance.
- Give yourself time to adapt to night schedule (sleep well).
- At ESO, have your Observation Blocs ready.
Exposure Time Calculators (ETCs) encapsulate the best knowledge that ESO has about its instruments. ETCs make you take into account all the factors that go into defining an observation and its conditions of execution.
Exposure time calculators

SOFI Exposure Time Calculator

Input Flux Distribution

- Uniform (constant with wavelength)
- Exponential: $\text{Temperature} = 11000.0$ Kelvin
- Object Magnitude: 21.2

- Single Line
  - Wavelength: 1550.000 nm
  - Flux: 1.000
  - FOV: 10 arcsec

Spatial Distribution: Point Source

Magnitudes are given per square arcsec for extended sources

Sky Conditions

- Overtle altitude, sky parameters and use instead typical sky model parameters except Moon phase and airmass
  - Moon F11: 0.20
  - Airmass: 1.50

- PWV: 30.0 mm
- Probability > 95% of realizing the PWV ≤ 30.0 mm

Seeing/Atmospheric Quality:

- turbulence Category: 1% seeing at 1.0 L score
- Air Mass: 1.50

Instrument Setup

- Filters: Wide Band, Narrow Band
- Objective: Large field

Results

- S/N ratio: Small
- S/N: 5
- DET: 20
Exposure time calculators

Sky Conditions

- Override almanac sky parameters and use instead typical fixed sky model parameters except Moon phase and airmass
  - Moon FL: 0.33
  - Airmass: 1.56

- PWV: 30.0 mm
  - Probability > 83% of realizing the PWV ≤ 30.0 mm

- Seeing/Image Quality
  - Turbulence Category: 10% seeing ≤ 0.5

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  - arcsec FWHM at the airmass and reference wavelength
  - The corresponding seeing and turbulence category will be indicated in the output page

Instrument Setup

- Filter:
  - Wide Band
  - Narrow Band: 1.06

- Selecting the filter sets the observation band

Results

- S/N ratio: S/N
- Exposure Time: NDT:

The total exposure time is the product of NDT (Detector Integration Time) by NDT (number of DITs). Instrument and telescope overheads are not taken into account.

Plots:

- Field All / No Plots
  - Detector Efficiency
  - S/N as a function of Exposure Time
  - S/N as a function of seeing (only for point-source)
  - Input spectrum in physical units
  - Sky spectrum
  - Sky transmission spectrum
Exposure time calculators

SOFI Transmission Model

Signal To Noise Versus Exposure Time

Graph showing the relationship between signal to noise and exposure time.

Graph showing another aspect of the SOFI Transmission Model.
Other tools

Ephemeris
Visibility plots
Satellite maps, weather conditions
All ESO telescopes are operated by the users through Observation Blocks, in which all the observations composing an observing program are defined.

- Each Observation Block (OB) is a “unit of observation”
  - Specifies the target acquisition and the observation description (instrument configuration, exposure parameters)
  - Can contain finding charts, ephemeris files
  - In Service Mode, the OB specifies time-critical constraints and conditions of observation

- OBs are built using purpose-specific templates
  - Templates can be for acquisition, for science observations, for calibration
  - Each ESO instrument has its own set of templates

- Containers can be defined in which OBs can be grouped, concatenated, or specified as time-critical

The OB concept (or equivalent) is nowadays used at most major observatories, ground-based and in space, at any wavelengths…
OBs are essential components of the ESO Dataflow System, involving different tools, processes, databases and sites.
The Phase 2 Preparation program (p2, or p2ls for La Silla)

*p2 is a web-based tool used to build OBs*

- OBs are constructed by putting their component templates together and filling their used-defined values using p2
- Groups and links among OBs are defined in p2
- Finding charts and other auxiliary files can be attached using p2
- p2 also provides an interface to communicate to the observatory generic information on Service Observing programs
- p2 provides an interface with the database where all OBs are stored
- The use of p2 “forces” you to plan your upcoming observing run in detail and well in advance
The Phase 2 Preparation program (p2, or p2ls for La Silla)

Upon authentication, p2s gives access to all the observing runs approved for the user as Principal Investigator.
The Phase 2 Preparation program (p2, or p2ls for La Silla)

An OB usually starts with the acquisition of the target
The Phase 2 Preparation program (p2, or p2ls for La Silla)

Several types of acquisition can be chosen from a list of options
The Phase 2 Preparation program (p2, or p2ls for La Silla)

The chosen acquisition template has several parameters that must be entered by the user.
The Phase 2 Preparation program (p2, or p2ls for La Silla)

The Observation Description usually contains science templates. Each instrument has typically many science templates to choose from.
The Phase 2 Preparation program (p2, or p2ls for La Silla)

Each science template defines the configuration of the instrument (optical components, detector windowing) and exposure parameters (exposure times, number of exposures, telescope offsets between exposures...).
The Phase 2 Preparation program (p2, or p2ls for La Silla)

Very often, each OB contains several science templates as part if the observation description.
The Phase 2 Preparation program (p2, or p2ls for La Silla)

While building the OB it is possible to compute the exposure time, plus the total execution time (exposure plus overheads)
The Phase 2 Preparation program (p2, or p2ls for La Silla)

It is possible to verify too that the parameters introduce make sense, that the instrument configuration does not include something awkward, and that the OB will not fail at execution time.
The Phase 2 Preparation program (p2, or p2ls for La Silla)

p2 offers some useful gadgets, like a visibility plot.
The Phase 2 Preparation program (p2, or p2ls for La Silla)

In Service Mode, the Constraint set specifying the worst possible conditions under which the OB can be executed and still be scientifically valid is an essential piece of information at the time to decide whether or not to execute an OB.
The ESO Archive as an observation preparation tool

With the ESO archive, you can locate observations similar to the ones you are planning, download them, experience with them, try your data reduction procedures...

This can be very useful if you have never used the instrument before
The ESO Archive as an observation preparation tool

All existing observations are easy to identify and select.
The ESO Archive as an observation preparation tool

Accessing and downloading the observations of interest is very easy and user-friendly.
So, once again...

ESO (and other places) offer you a good assortment of tools to prepare your observations – use them, it is worth doing!!