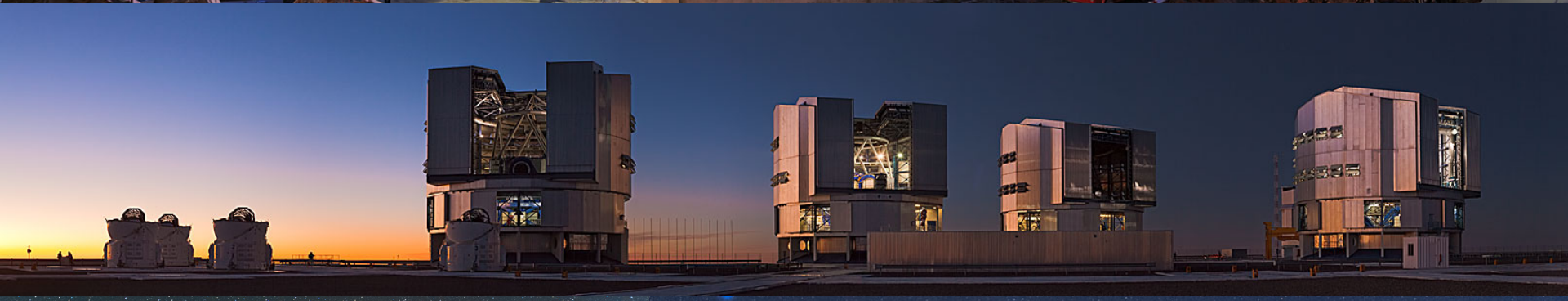
Observing at ESO

Service vs Visitor Mode

Data-flow services and tools at your disposal

Marina Rejkuba

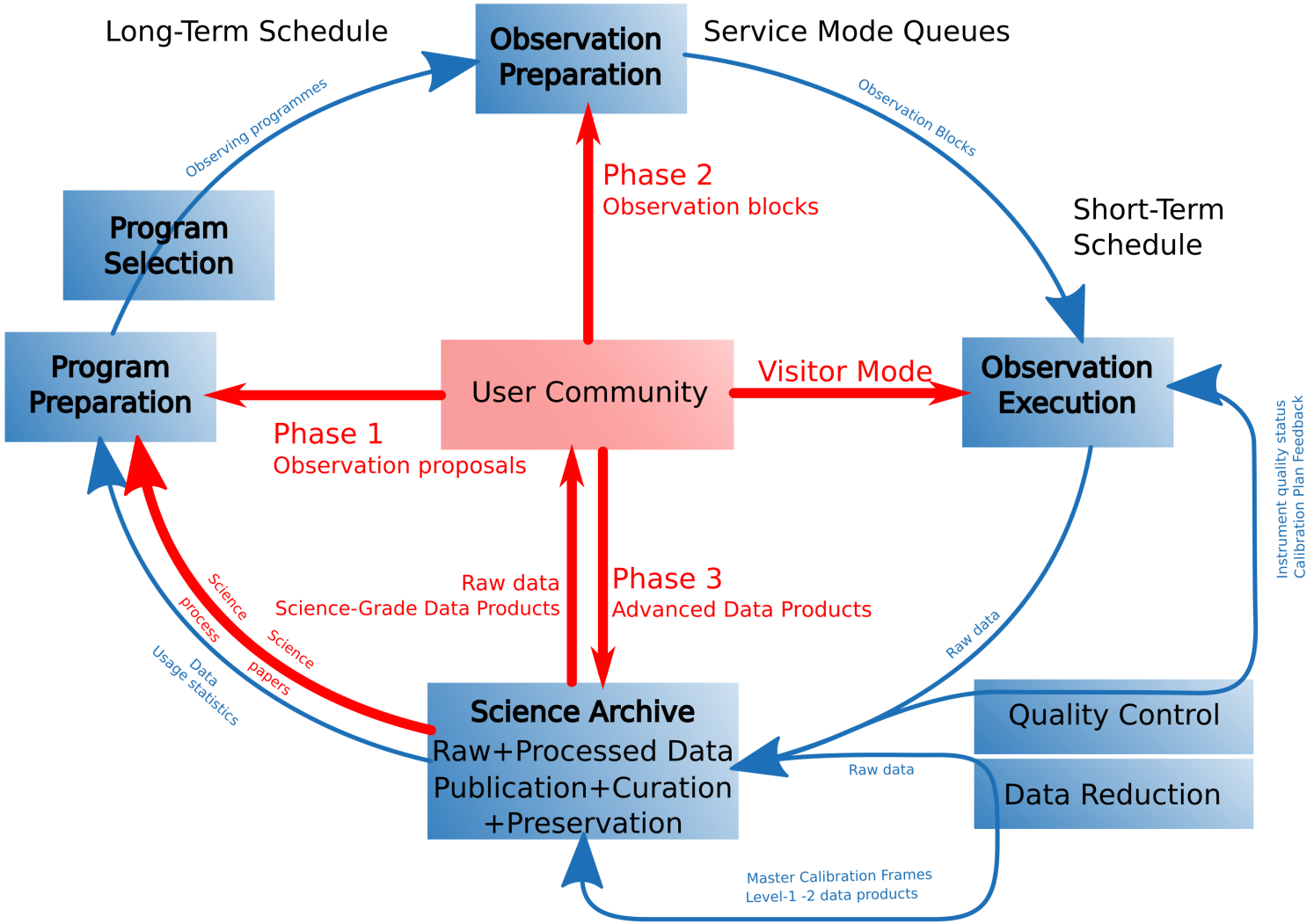
Observatories



ESO's sites


Garching bei München
Chajnantor
Paranal
La Silla
Santiago
Earth at Night
More information available at:
http://antwrp.gsfc.nasa.gov/apod/ap001127.html
Astronomy Picture of the Day
2000 November 27
http://antwrp.gsfc.nasa.gov/apod/astropix.html

VLT end-to-end system



Observing Modes and Programme Types

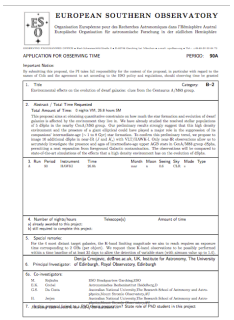
- Different observing modes
  - (designated) Visitor Mode
  - Service Mode
- Different programme types
  - Normal Programmes
  - Large Programmes
  - Public Surveys
  - Calibration programmes
  - Monitoring programmes
  - Target of Opportunity (ToO)
  - Rapid Response Mode (RRM)
  - Guaranteed Time Observations (GTO)
  - Director Discretionary Time (DDT)

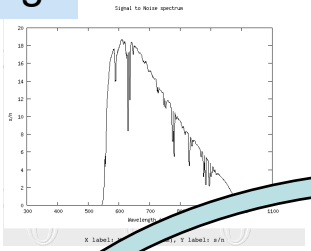
Following the OPC recommendations

- Visitor Mode
- Service Mode Programme Ranks
  - Scientific prioritization
    - A: highest priority (possibly carried over) ~ ½ of the time in Service Mode
    - B: medium priority ~ ½ of the time in Service Mode
    - C: low priority/filler → on top of A+B rank class
- Adaptation to changing atmospheric conditions

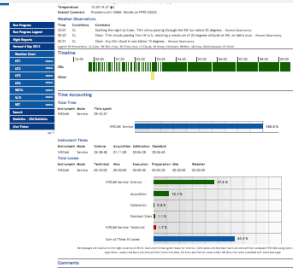
Data flow end-to-end tools

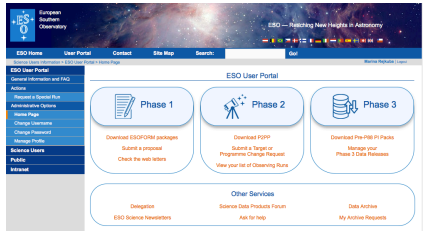
Proposals handling & Long-term scheduling

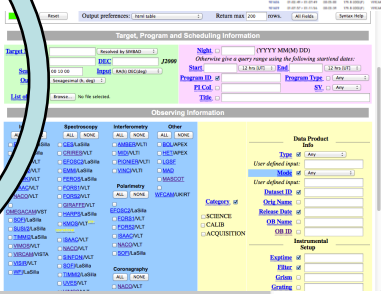


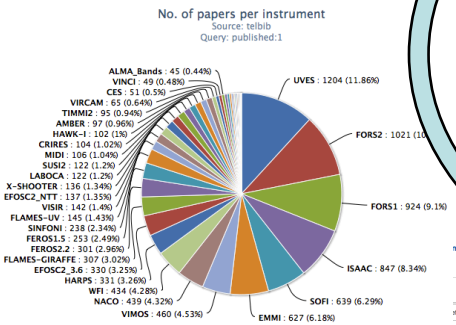


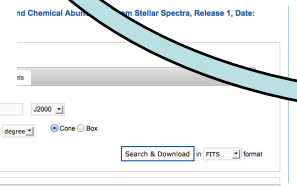
Observation preparation, execution & reporting

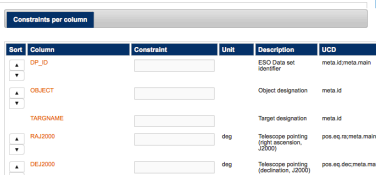


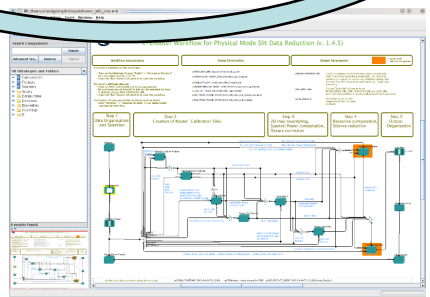


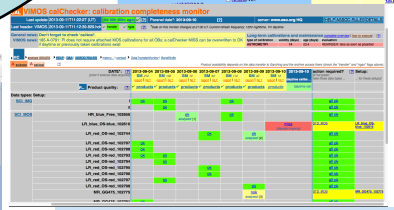








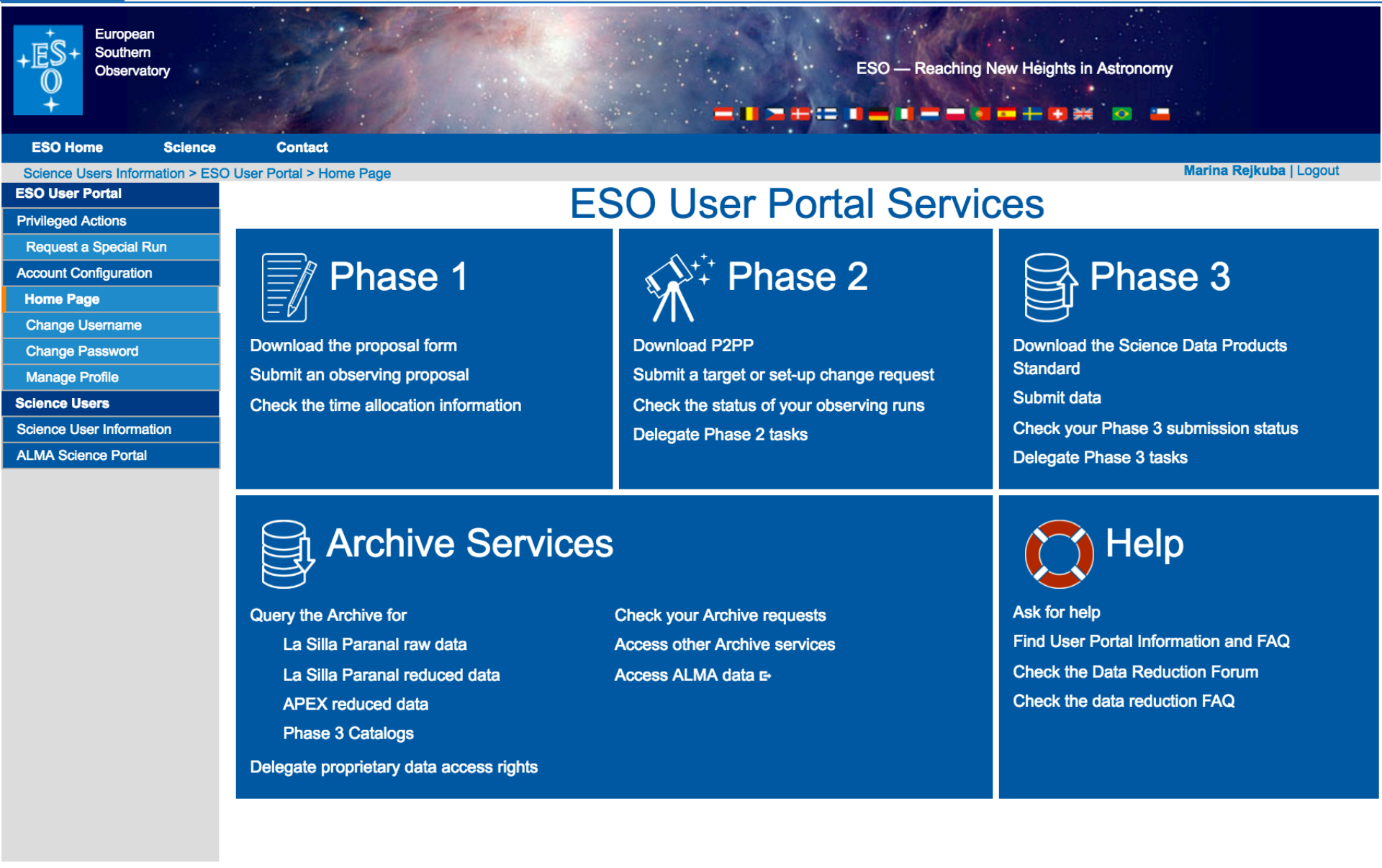




Science return: Data Products & Publications

Post-observation: archive, quality control, data reduction pipelines

User Portal: your entry to ESO



Phase 2 Instrument Overview Table

Phase 2 Instrument Overview Table

For information, please follow the links in this table. If one instrument has special requirements, this is visualized in the relevant row of the table. A summary table of the main characteristics of all instruments is available here.

Instrument	Policies		Change Requests	FC/README	Documentation	Tools	FAQ
General information valid for all instruments							
Paranal instruments	SM specifics OB naming	Constraints Calibrations	Waivers / Change Requests	Finding Charts README	P2PP version 3 Manual Generic P2PP3 tutorials	Exposure Time Calculators Observability	FAQ
Instrument-specific information							
AMBER	SM specifics OB Naming	Constraints Calibrations	N/A	Finding Charts README	User Manual P2PP Tutorial	-	FAQ
CRIRES	SM specifics OB Naming	Constraints Calibrations	Waivers	Finding Charts README	User Manual P2PP Tutorial	-	FAQ
FLAMES	SM specifics N/A	N/A Calibrations	Waivers	Finding Charts N/A	User Manual P2PP Tutorial	FPOSS	FAQ
FORS2	SM specifics OB Naming	N/A Calibrations	Waivers	Finding Charts N/A	User Manual P2PP Tutorial	FIMS	FAQ
GRAVITY	SM specifics OB Naming	Constraints Calibrations	Waivers	Finding Charts README	User Manual		FAQ
HAWK-I	SM specifics N/A	Constraints Calibrations	Waivers	Finding Charts README	User Manual P2PP Tutorial	GUIDECAM	FAQ
KMOS	SM specifics OB Naming	Constraints Calibrations	Waivers	N/A README	User Manual P2PP Tutorial	KARMA	FAQ
MUSE	SM specifics OB Naming	Constraints Calibrations	Waivers	Finding Charts README	User Manual -	-	FAQ
NACO	SM specifics OB Naming	Constraints Calibrations	Waivers	Finding Charts README	User Manual P2PP Tutorial	NAOS PS	FAQ
OmegaCAM	SM specifics OB Naming	Constraints Calibrations	Waivers	Finding Charts README	User Manual P2PP Tutorial	SADT	FAQ
PIONIER	SM specifics OB Naming	Constraints Calibrations	Waivers	Finding charts README	User Manual P2PP Tutorial	CalVin, SearchCal (JMMC) VisCalc, Aspro (JMMC)	FAQ
	SM specifics	Constraints		Finding Charts	User Manual		

Service vs Visitor Mode

- Service Mode
  - Maximize the **science efficiency**
    - ✓ Highest priority programmes have the execution priority and are executed under optimal (required) observing conditions
  - Maximize the **operational efficiency**
    - ✓ Sharing the calibrations between the programmes
    - ✓ Optimization of the observing time between different programmes
  - Maximize the **scientific use of telescope time** under any condition
  - Maximize the **scientific productivity** via uniform datasets
- Visitor Mode
  - Real-time decisions: optimization of observing strategy & overheads

Service Mode Rules

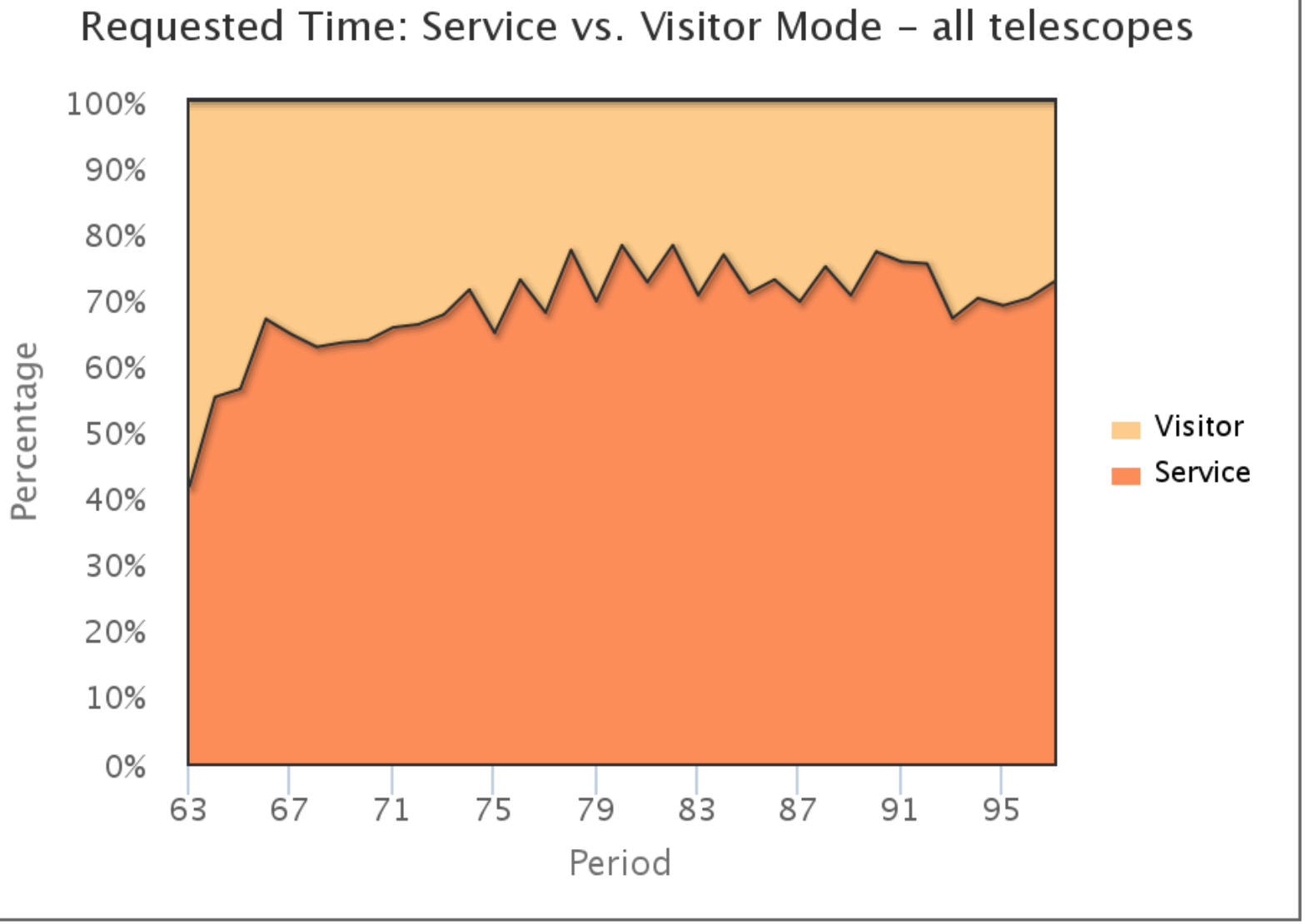
See Call for Proposals & Phase 2 SM Policies webpage:

http://www.eso.org/sci/observing/phase2/SMPolicies.html

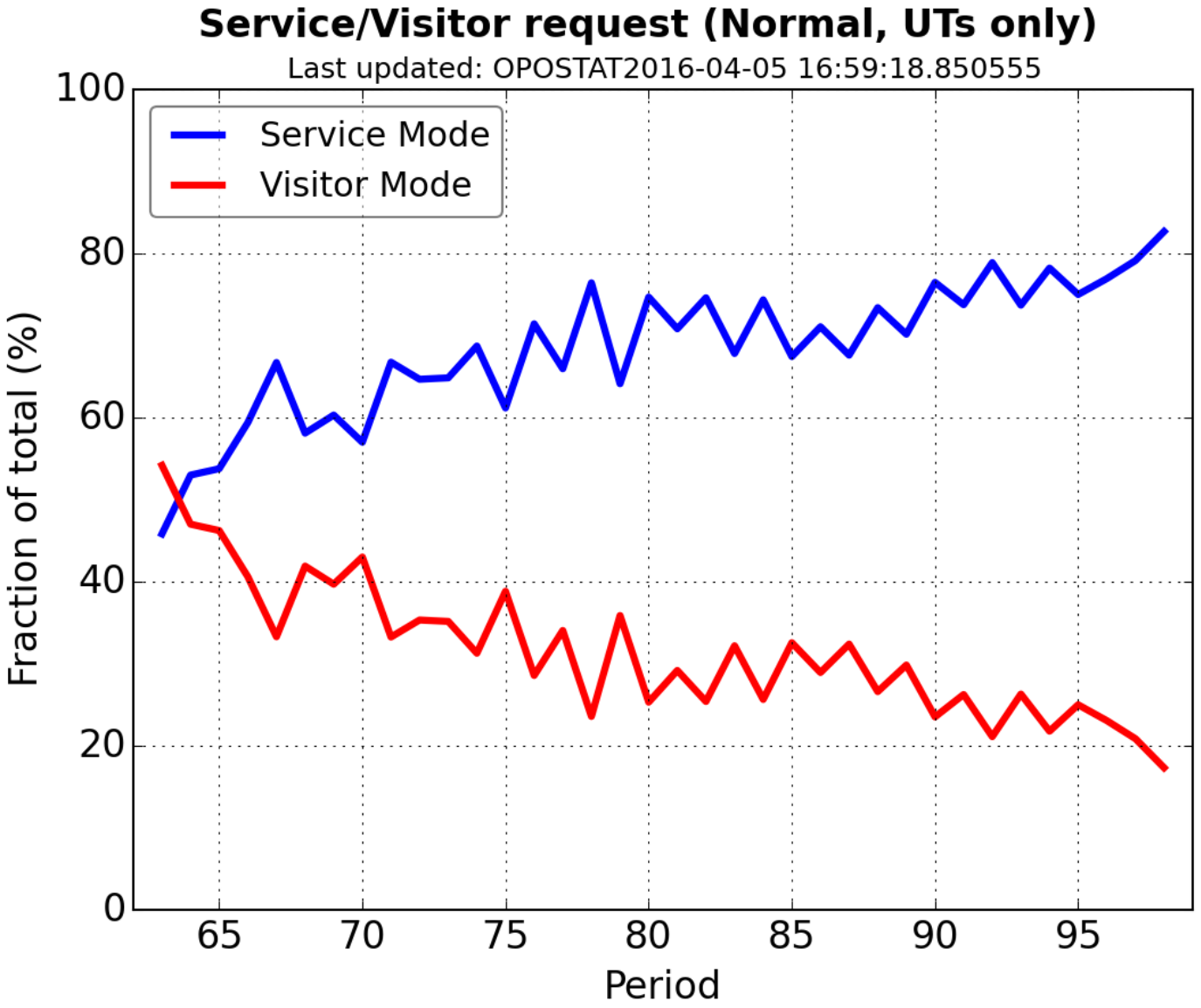
- Phase 1 observing constraints are binding
- Phase 1 Targets & Instrument setup are binding
- Total execution time = Total allocated time
  - No saving of overheads by skipping allocation
- Observations are self contained units (OBs)
  - 1h maximum OB length → flexible scheduling
- Time critical observations can **EXPIRE**!

- Exceptions that confirm the rule: waiver request

Service vs Visitor Mode Request

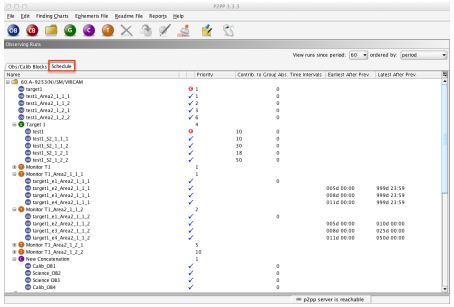


SM-VM [un-]balance

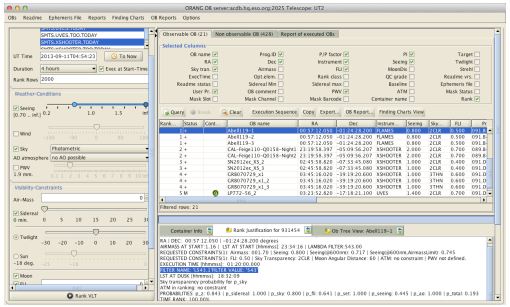


Paranal Phase 2 tools

- Development driven by VISTA & VST Public Surveys (2009, 2011)
- Deployment on VLT and VLTI (2012)

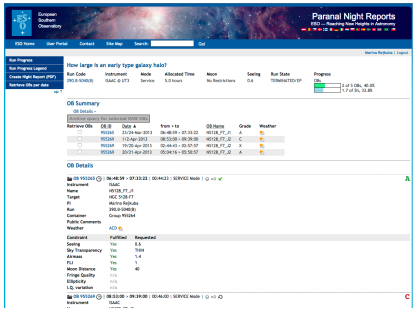


- Observation preparation tool: P2PP3
  - Design of computer literate observing strategy
  - Phase 2 delegation



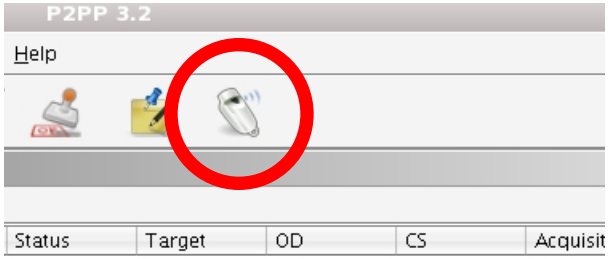
- Observation Tool for Service Mode: OT3
  - Effective ranking engine
  - Laser collision prediction
  - Integrated reporting

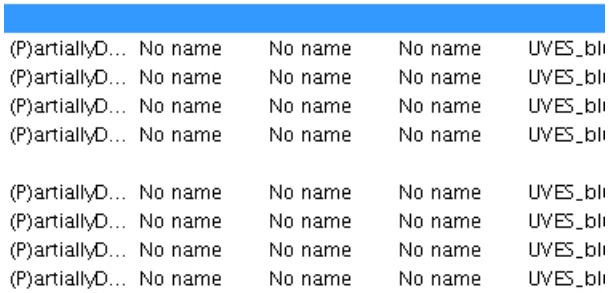
- Observation Tool for Visitor Mode: vOT



- Observation reporting tool: NLT & gNLT
  - Automatic harvesting of observation slots
  - Subscription to observation notification

What happens after the whistle?





Last step

Blow the whistle

=

click P2PP-submit

notification is sent to USD indicating that Phase2 submission is done

Your User Support Astronomer revises Phase 2 material …

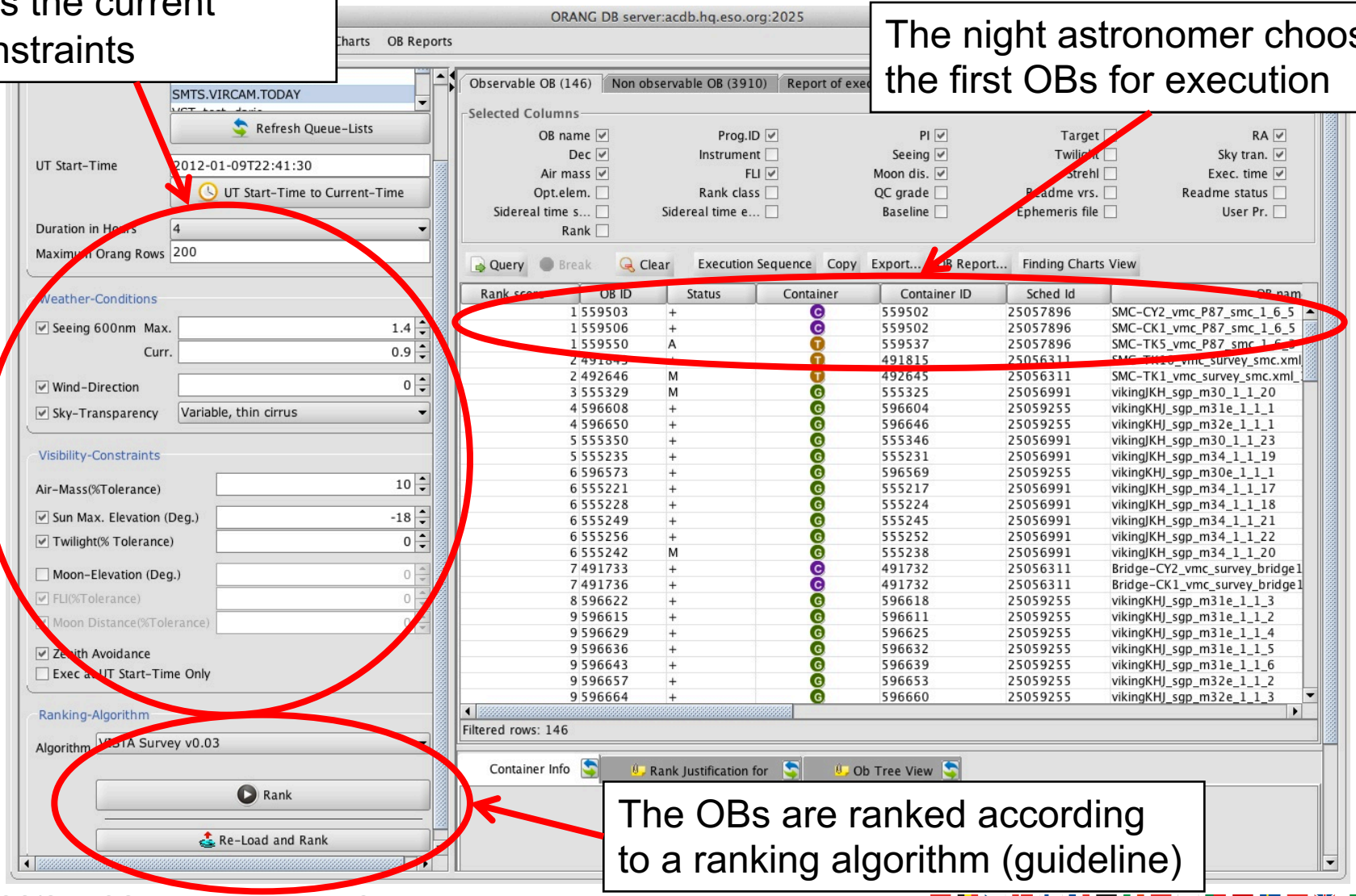
…and…

…, after approval, passes it to the observing queue

Observing Tool: SM on Paranal

The night astronomer sets the current constraints

The night astronomer chooses the first OBs for execution



The OBs are ranked according to a ranking algorithm (guideline)

Service Mode Ranking

Rank_string = <observability_class$_{PP}$>_
<rank_class>_
<user_priority>_
<inverted normalized group score>_
<inverted normalized group contribution>

$observability\_class_{PP} = 10 * NINT(10 * R_{time} * R_{constraint}) + PP$

→ Result: 000, 010, 020, …, 100
→ PP – push-pull factor applied to obs_class (-100…0…+100) in order to reflect rank classes of programmes

Ranking algorithm prefers observations that have low probability to be completed within requested constraints (setting targets, challenging constraints).

Observability class

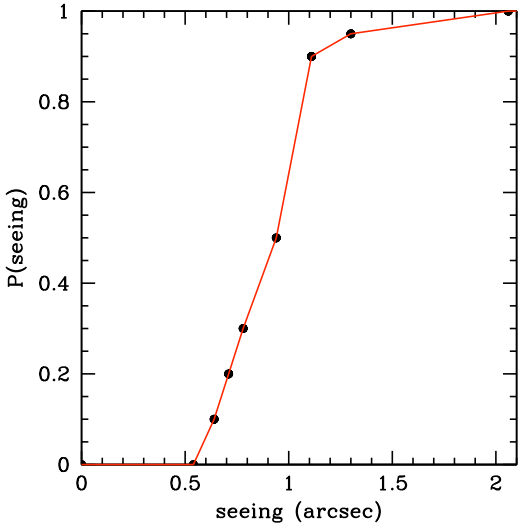
$$observability\_class_{PP} = 10 * NINT(10 * R_{time} * R_{constraint}) + PP$$

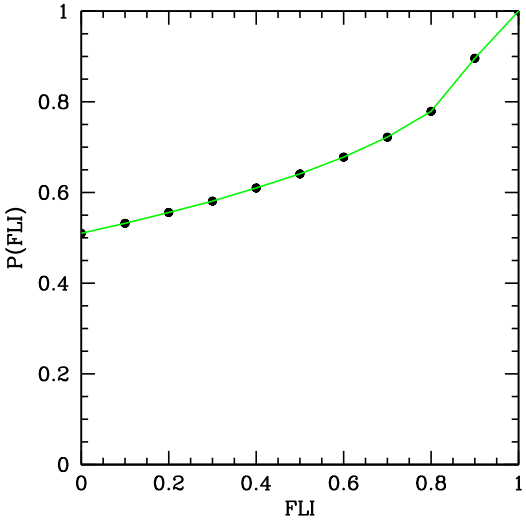
- Time-Critical OB rank:

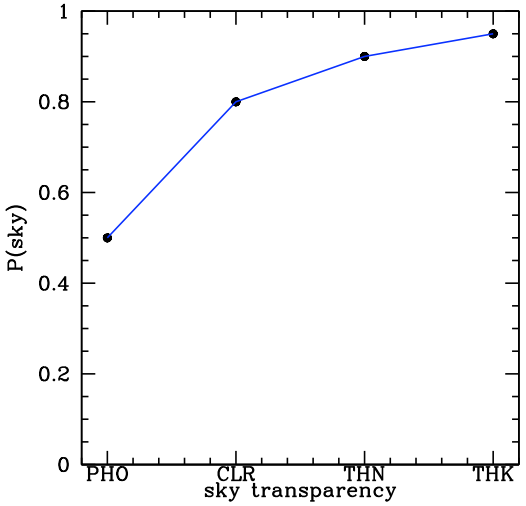
$$R_{time} = \min[1.0,\ (\Delta t_{TotRemaining} - \Delta t_{OBexectime}) / 30\ days]$$

- Constraint rank:

$$R_{constraint} = P_z * P_{sky} * P_{FLI} * P_{set} * P_{seeing}$$

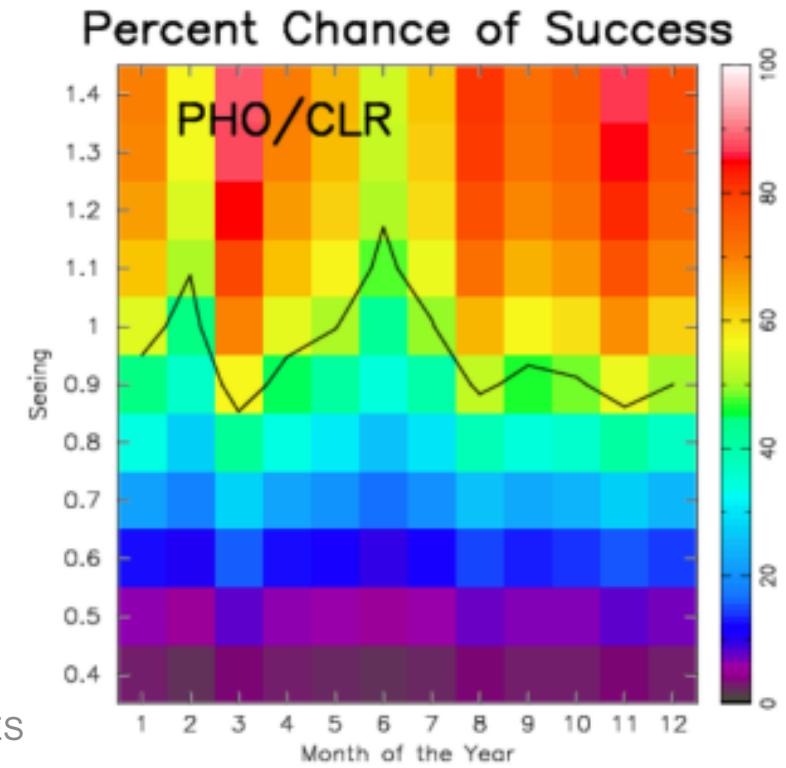


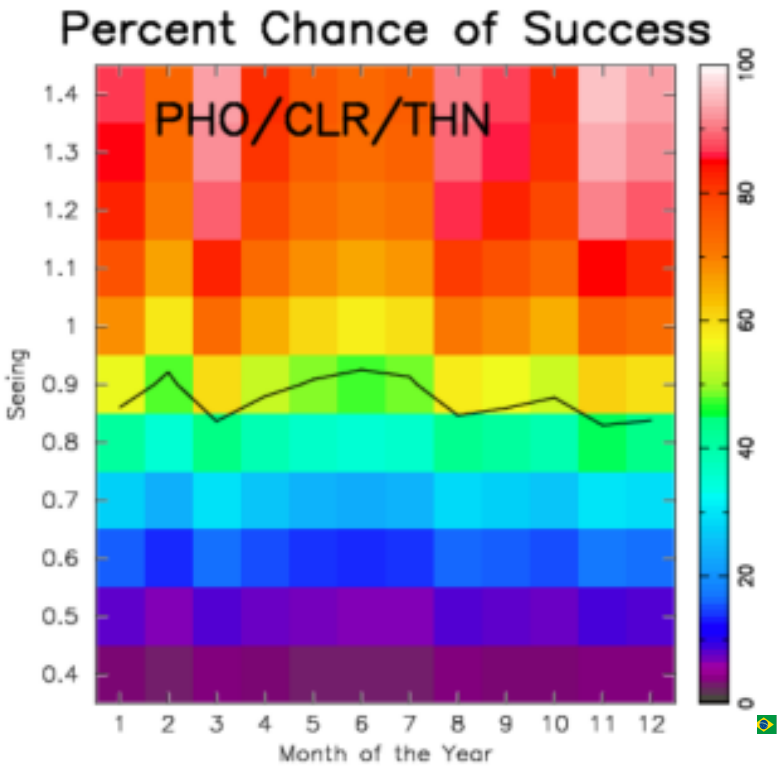




Selecting Observing Constraints: sky transparency, FLI, seeing

- Transparency
  - Are photometric conditions really necessary? Do you need flux calibration?
  - For spectroscopy often CLR/THN is sufficient…
  - Too relaxed constraint may cause loss of guide/reference stars





Seeing vs Image Quality

- ***Seeing*** *is an inherent property of the atmospheric turbulence, which is independent of the telescope that is observing through the atmosphere.*
  - @Phase 1: specify seeing (V-band, zenith)

- ***Image Quality (IQ)****, the full width at half maximum (FWHM) of long-exposure stellar images, is a property of the images obtained in the focal plane of an instrument mounted on a telescope observing through the atmosphere.*
  - @Phase 2: specify desired IQ at the observed wavelength and (maximum) airmass

Exposure Time Calculators: Seeing – IQ calculation

Image Quality
Image Quality FWHM : **0.48** arcsec ***(to be used for OB constraint set)***
☑ **show details of the IQ calculations**

The Image Quality PSF FWHM is modeled as the convolution of the gauss-approximated PSFs of the atmosphere, telescope and instrument transfer function, at the wavelength and airmass of observation. See the helpfile for details.

$$FWHM_{IQ} = \sqrt{FWHM_{atm}^2 + FWHM_{tel}^2 + FWHM_{ins}^2}$$
$$= 0.48 \text{ arcsec}$$

Seeing $= FWHM_{500nm,zenith} = 0.80$ arcsec

Atmosphere *(see the helpfile)*

$$FWHM_{atm} = FWHM_{500nm,zenith} \cdot (\lambda_c/500nm)^{-1/5} \cdot airmass^{3/5} \cdot \sqrt{1 + F_{Kolb} \cdot 2.183 \cdot (r0_{(\lambda,\ airmass)}/L_0)^{0.356}}$$
$$= 0.80 \text{ arcsec} \cdot (2197nm/500nm)^{-1/5} \cdot 1.20^{3/5} \cdot \sqrt{1 + (-0.991) \cdot 2.183 \cdot (0.666 \text{ m}/23 \text{ m})^{0.356}}$$
$$= 0.80 \text{ arcsec} \cdot 0.744 \cdot 1.116 \cdot \sqrt{0.387}$$
$$= 0.413 \text{ arcsec}$$

Telescope *(diffraction limited PSF FWHM for the D= 8.200m telescope at observing wavelength λ_c=2197nm)*

$$FWHM_{tel} = 1.028 \cdot \lambda_c/D$$
$$= 1.028 \cdot (2197 \cdot 10^{-9}\text{m}) / 8.200\text{m} \cdot (180/\pi \cdot 3600) \text{ arcsec}$$
$$= 0.057 \text{ arcsec}$$

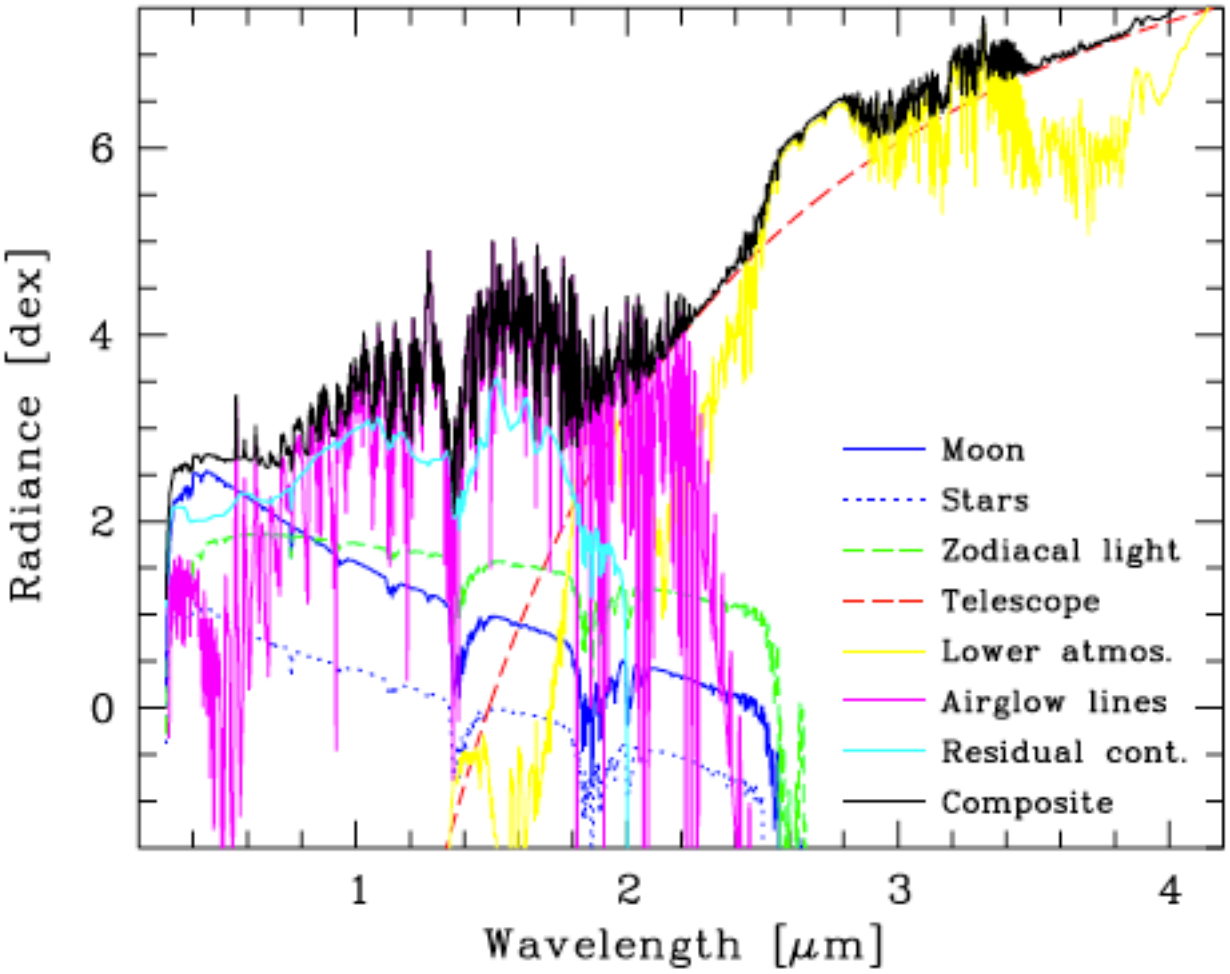
Instrument *(instrument transfer function FWHM at observing wavelength)*

$$FWHM_{ins} = 0.230 \text{ arcsec}$$

Image Quality

$$FWHM_{IQ} = \sqrt{FWHM_{atm}^2 + FWHM_{tel}^2 + FWHM_{ins}^2}$$
$$= \sqrt{0.413^2 + 0.057^2 + 0.230^2} = 0.48 \text{ arcsec}$$

Paranal sky

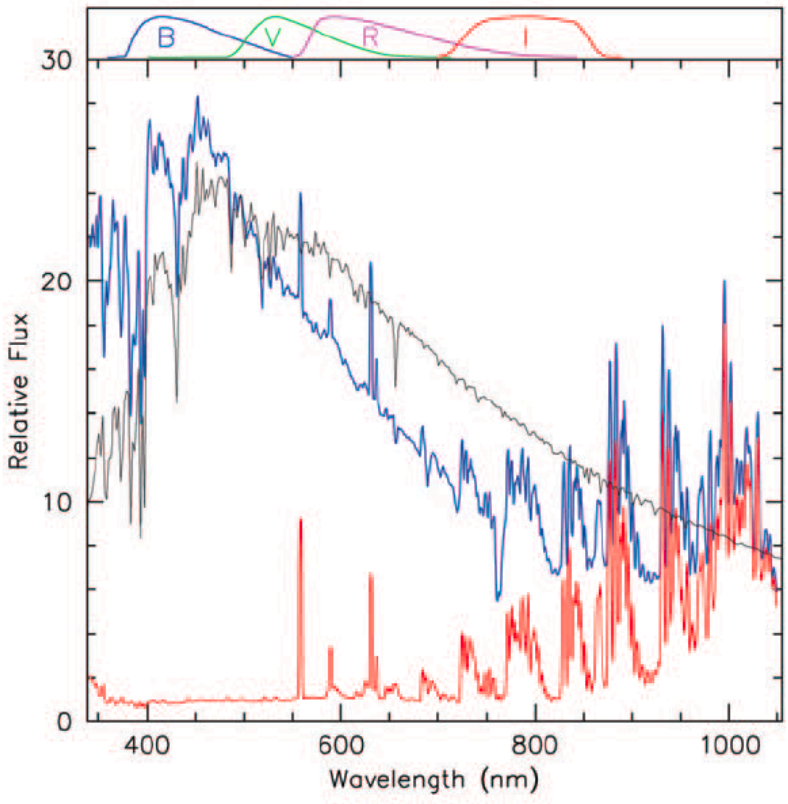


Moon above the horizon:
- scattered moonlight
- scattered starlight
- zodiacal light
- thermal emission
- molecular emission of the lower atmosphere
- airglow emission of the upper atmosphere
- airglow/residual continuum

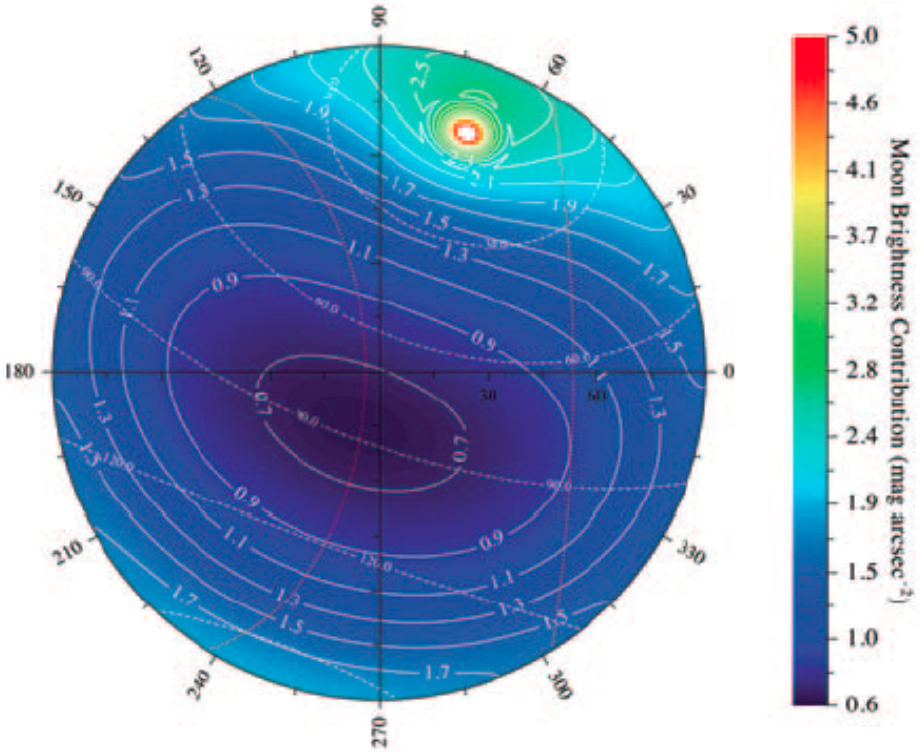
Noll et al. 2012

Bright or Dark and how far from the moon?

Patat 2004, Messenger

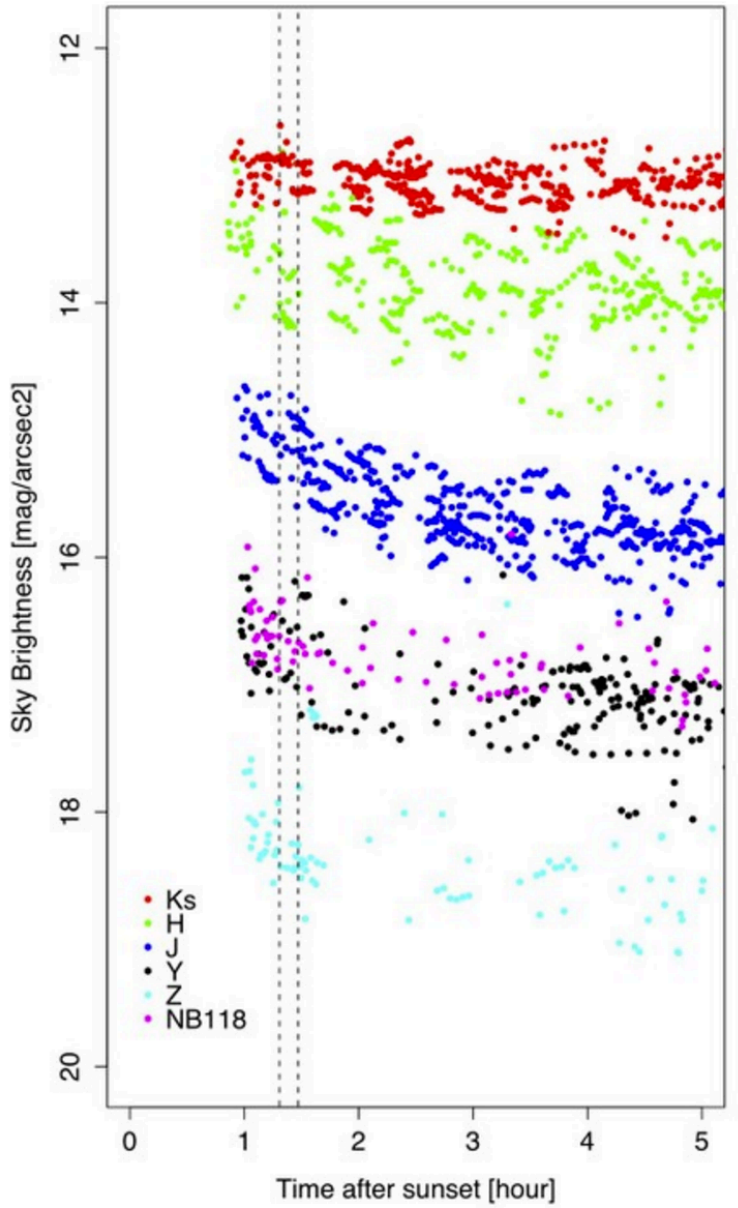


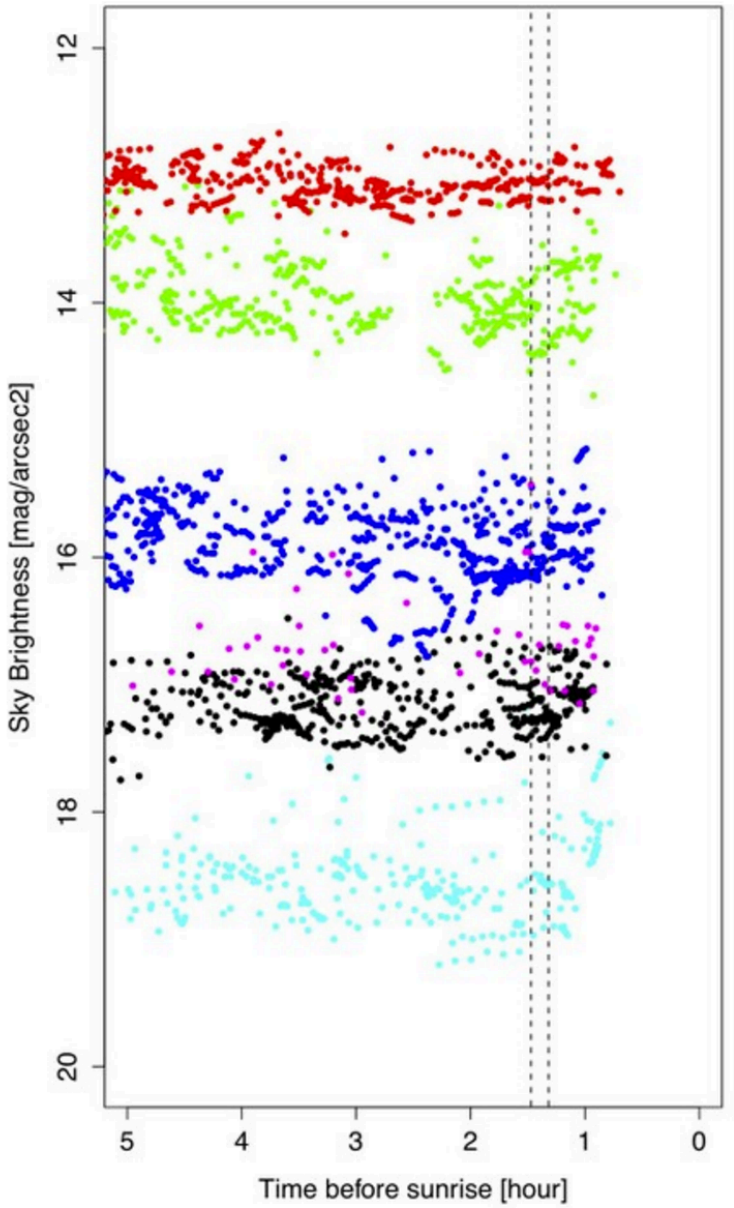
B-filter, FLI=0.5,
moon elevation 20



Blue = sky spectrum during bright time
Red = sky spectrum during dark time
Black = model spectrum of a solar-type star

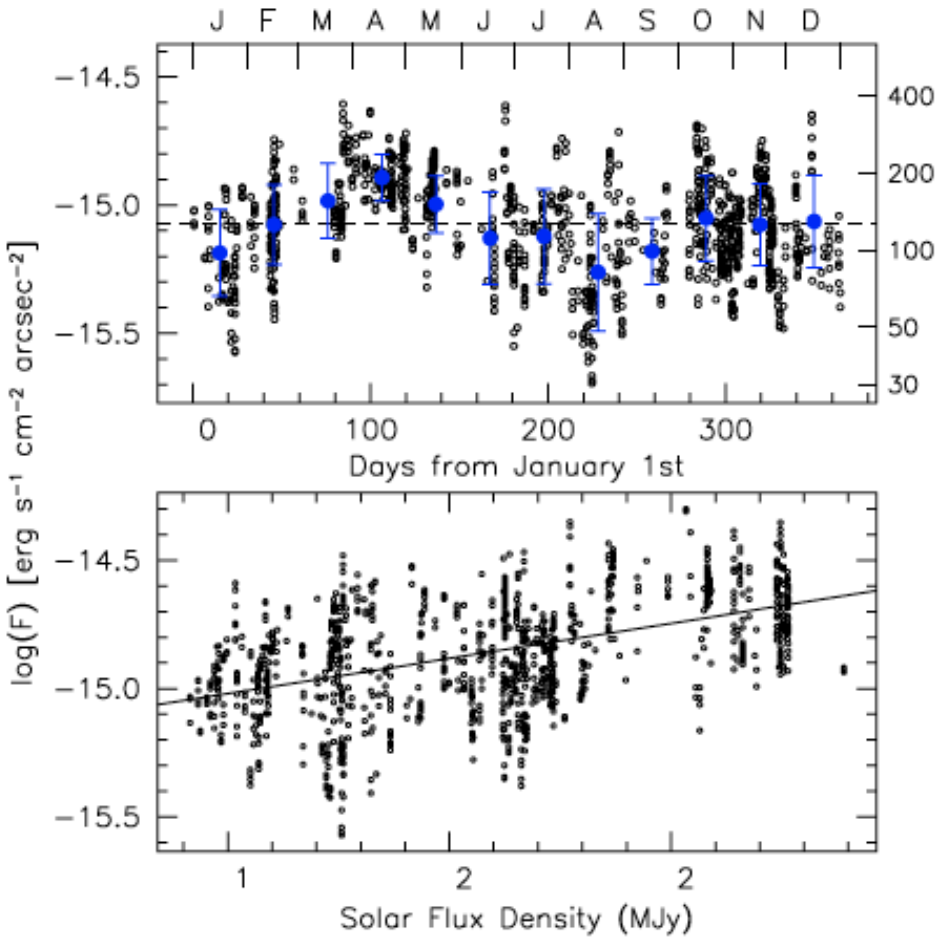
Twilight constraint



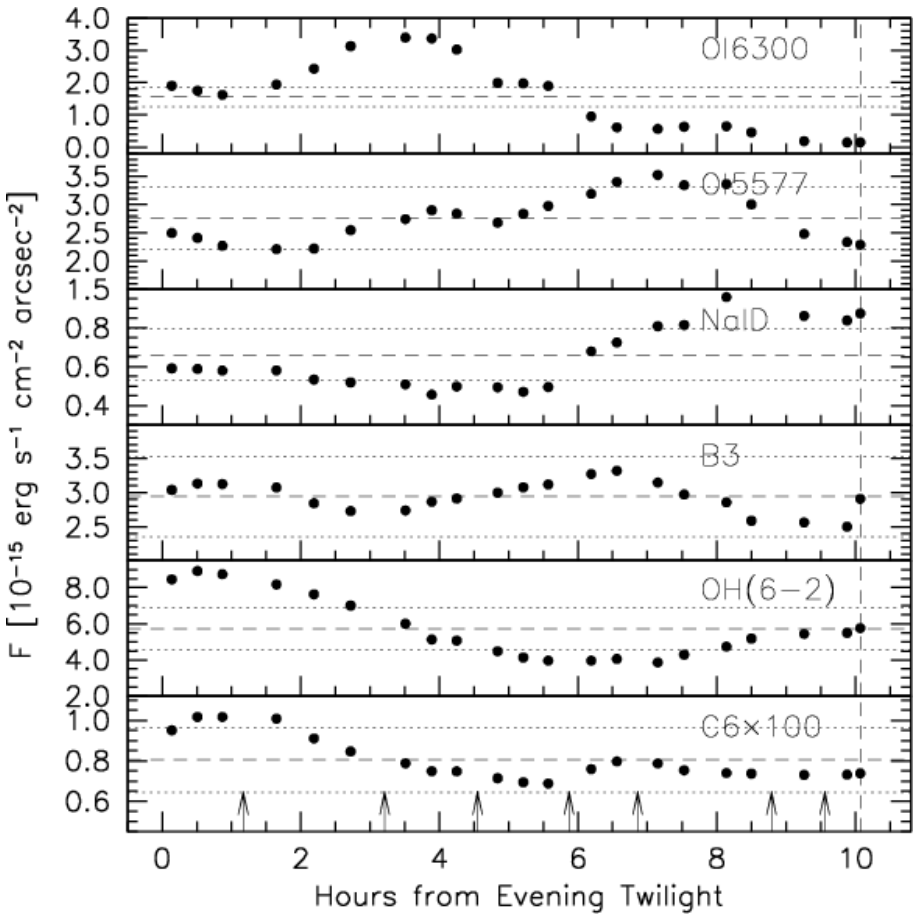


The dancing sky (Patat 2008, A&A)

[OI]5577 line flux seasonal variations



Sky emission variations during one night
FORS1 spectra (2001-04-22)



Calibrations

- Are all calibrations needed part of the instrument calibration plan?
- Calibration accuracy
  - Master calibrations are produced by the Quality Control Group and are available in the ESO Science Archive
  - Trend analysis
- Extra Day-time calibrations – need a waiver but come for “free”
- Extra Night-time calibrations – time taken from the allocated time for the programme

Quality Control: Health Check Monitor

CAL | HC | refs | QC

HealthCheck Monitor

HOME | UsersGuide

ALL INSTRUMENTS

FULL reports

XSHOOTER:

score overview

UVB

detector: bias
detector: parameters
distortion correction
format stability
wavelength calib.
lamps: arc & flat
efficiency

VIS

detector: bias
detector: parameters
distortion correction
format stability
wavelength calib.
lamps: arc & flat
efficiency
SNR

NIR

detector: dark
detector: parameters
distortion correction
format stability
wavelength calib.
lamps: arc & flat
efficiency
SNR

Acquisition Camera

detector

QC XSHOOTER

Other HC:

UT1
FORS2
KMOS
NACO
UT2
FLAMES/GIRAFFE
UVES&FLAMES/UVES
X-SHOOTER
UT3
SPHERE
VIMOS
VISIR
UT4
HAWK-I
MUSE
SINFONI
VLTI

[page auto-refreshes after 300 sec] [stop | on] [press Ctrl+Shift+R to enforce refresh of scores, dates and news]

XSHOOTER trending system: HEALTH CHECK report

HELP|USERS-GUIDE|MORE

Last update: 2016-05-08T22:58:02 (UT) **(0d 21h:56m ago)** | now: 2016-05-09T20:54:40 (UT) QC pipeline: xshoo-2.7.0 (installed 2016-03-17)

same group: wavecal_slit wave_slit_time wave_ifu_time

General news:
XSHOOTER news:
Report news: edit

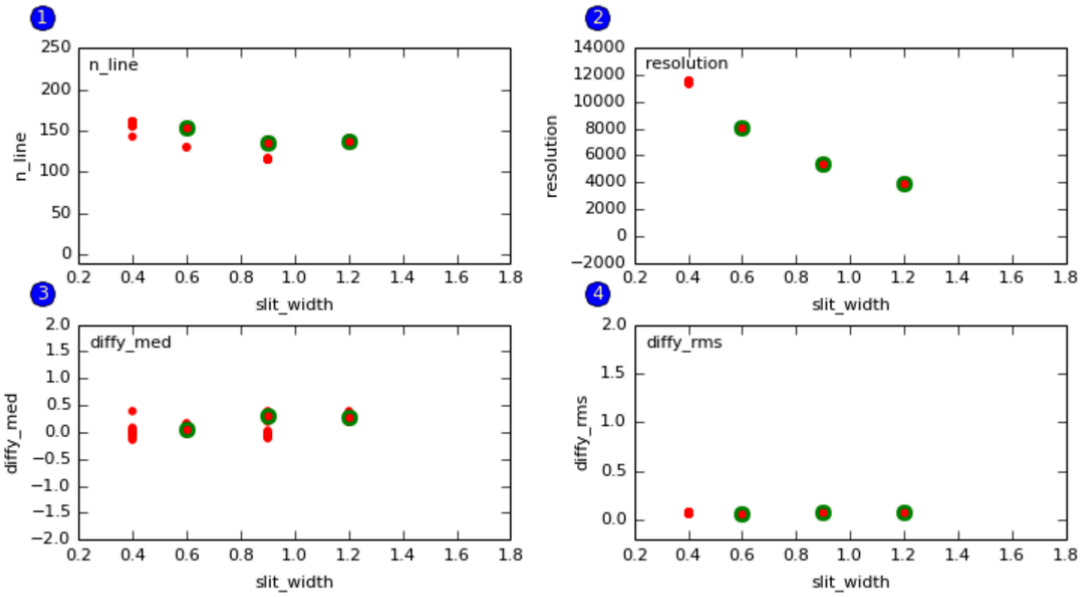
DATE*: [?]	2016-05-02	2016-05-03	2016-05-04	2016-05-05	2016-05-06	2016-05-07	2016-05-08
	report | NLT report	report | NLT	report | NLT	report | NLT	report | NLT	report | NLT	report | NLT
r... Raw CAL displays:	raw	raw	raw	raw	raw	raw	raw
P... Product quality:	products	products	products	products	products	products	products

✔ transfer ✔ ngas [?] forced refresh

scores&comments | history ... | plot tutorial ... | contact daily/often; important to check [?] *Date on this monitor changes at 21:00 UT

XSHOOTER: NIR ARC_SLIT parameters (last 90 days)

QC data range: 2016-02-09 ... 2016-05-04*



powered by QC: www.eso.org/HC created by trendPlotter v3.6.2 on 2016-05-08T22:58:00

Print:
- png file

Information and research:
- **advanced studies:** QC1 browser | QC1 plotter

Quality Control: Known Problems

http://www.eso.org/observing/dfo/quality/XSHOOTER/qc/problems/problems_xshooter.html

XSHOOTER Quality Control: Known Problems

CAL | HC | refs | QC
QUALITY CONTROL
HOME
XSHOOTER QC
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Problems may also be related to the pipeline processing .

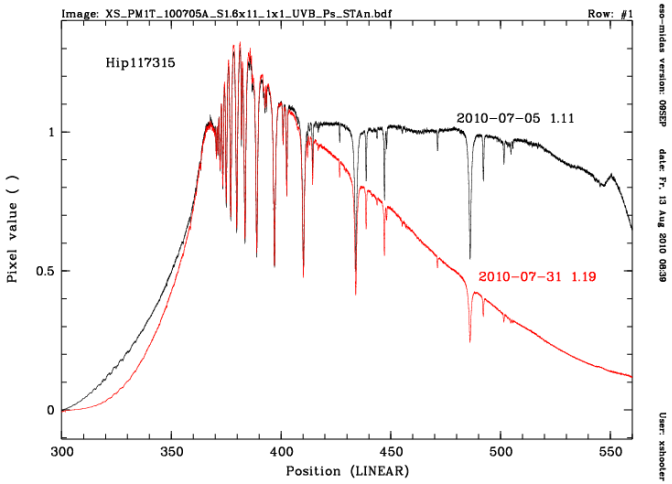
UVB wrong acq. coord. UVB ADC stuck UVB pickup noise
VIS VIS bias pattern VIS remnance
NIR new slits NIR FF lamp NIR remnance K band vignetting

top Acquisition coordinates wrong for g_prime filter

From **April 11 to May 14, 2011**, the reference positions for both the **g** and the **U** band filter were wrong. (-1.4 pixels for the g' and –2 pixels for the U band filter.) This not only leads to considerable flux loss for narrow slits, but also to a bad wavelength calibration for wider slits.

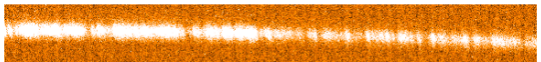
top UVB Atmospheric Dispersion Compensator stuck

From **July 18 to August 2, 2010**, the **A**tmospheric **D**ispersion **C**ompensator (ADC) of the UVB arm was stuck and did no longer adapt to changes in airmass or observing mode (SLIT vs. IFU). This resulted in strong vignetting of IFU data and in slit losses for SLIT data. Below you find a plot comparing observations of the same telluric standard stars with (**red**) and without (**black**) that problem (airmass noted besides date). The spectra were scaled to overlaps between 350nm and 400nm.



top Pickup noise in UVB data

The UVB CCD somtimes suffers from (horizontal) pickup noise, which is visible in low signal data and shows up in the rectified data as tilted lines. Below you see an example of raw data (rotated by 90 degrees) and merged rectified data. The example shown was observed in nodding mode, which creates the bright and dark region in the merged rectified data.



Instrument News

https://www.eso.org/sci/facilities/paranal/instruments/kmos/news.html

KMOS News

Instrument Status

KMOS is in operation with all 24 arms.

News

- 2015-12-11 Starting from P97, we have included the new keyword NCYCLES in the KMOS_spec_obs_freedither template that can be used to repeat the defined dither cycle including sky observations NCYCLES times. This allows i.e. to stay on a target and take NCYCLES observations, making the design of transit observations easier.
- 2015-12-10 Starting from P97, darks with DITs corresponding to science obersvations, will no longer be taken by default. The 60s darks, that are used by the pipeline for the bad pixel correction will still be taken on a daily basis. This new procedure allows to remove the constraints on the usable DITs making the design of OBs more flexible and time-efficient.
- 2015-06-11 A facebook group has been created to exchange ideas, methods, software on KMOS data reduction and analysis. We try to add the discussion items of this group to the ESO forum on a regular basis.
- 2015-03-04: After an intervention to upgrade all arms, KMOS was handed back to Science Operation for recommissioning and testing.
- 2015-01-22 Arm 2 was put in simulation
- 2014-12-02 Arm 19 was put into simulation
- 2014-11-21 Arm 8 was put into simulation.
- 2014-11-18 Arm 4 was put into simulation.
- 2014-10-06: Arm 5,6,7,and 16 have been replaced, Electronics of Arm4 were changed. All arms except 11 are back in operation.
- 2014-08-24: Arm 7 in simulation.
- 2014-08-07: Arm 15 has been recoverd and is back in operation.
- 2014-08-06: Arm 5 was put in simulation.

Getting help

- Ask for help link in the User Portal
- E-mail to usd-help@eso.org