Report from LPO

Andreas Kaufer
Steffen Mieske
44th UC Meeting, 29 April 2020
Public
LSP Observatory Operations

Telescope Statistics P103 (April 2019 - September 2019)

- **Science time**
- **Engineering time**
- **Commissioning time**
- **Technical Downtime**
- **Weather Downtime**

The chart shows nights for various telescopes and facilities from April 2019 to September 2019.
LSP Observatory Operations

Telescope Statistics P103

- **VLT(I):**
  - 659 (115) nights scheduled for scientific observations
  - 1.6% (6.5%) technical losses (out of scheduled science time)
  - 13.4% (22.1%) weather losses (out of scheduled science time)

- **VISTA**
  - 94 nights scheduled for scientific observations
  - 1.2% technical losses
  - 8.2% weather losses

- **VST**
  - 171 nights scheduled for scientific observations
  - 1.6% technical losses
  - 23.8% weather losses

- **La Silla**
  - 339 nights for science scheduled on the NTT and the 3.6-m telescopes
  - 0.7% technical losses
  - 21.9% weather losses

- **APEX**
  - 159 days scheduled for scientific observations
  - 1.4% technical losses
  - 12.3% weather losses
LSP Observatory Operations

Telescope Statistics P104

- **VLT(I):**
  - 647 (89) nights scheduled for scientific observations
  - 1.4% (10.1%) technical losses (out of scheduled science time)
  - 11.0% (8.6%) weather losses (out of scheduled science time)

- **VISTA**
  - 168 nights scheduled for scientific observations
  - 3.7% technical losses
  - 15.8% weather losses

- **VST**
  - 174 nights scheduled for scientific observations
  - 2.8% technical losses
  - 15.7% weather losses

- **La Silla**
  - 302 nights for science scheduled on the NTT and the 3.6-m telescopes
  - 0.6% technical losses
  - 11.4% weather losses

- **APEX**
  - 75 days scheduled for scientific observations
  - 3.4% technical losses
  - 3.3% weather losses
Chile crisis after 18 October 2019

- Travel restrictions due to curfew hours and security concerns resulted in slow de-staffing of observatories
- When curfew was lifted after a week, re-staffing resumed
- Preventive measures e.g. for commuting stayed in place for several weeks

Impact on Observing time

- La Silla: no losses
- Paranal:
  - no science operation of VST/VISTA for a week
  - reduced science operations on some UTs for a few nights
- APEX: lost several days and nights of science operation
Early measures taken to prevent arrival of virus to sites

- End of February: written declarations on travel history and health status for all international travelers
- Early March (1st case in Chile): written declarations for all national travels of staff, contractors and visitors (including visiting astronomers)
- Mid-March:
  - moved to restricted operations to reduce number of staff on sites (and therefore reduced person-to-person contacts on site and during travel to/from sites)
  - travel with personal protection equipment
- Late-March (1000 cases in Chile):
  - Safe commuting to/from sites could not be ensured anymore
  - Decision to cease science operation and move to safe state with minimal teams on site to ensure safety and security
COVID-19 crisis (2/2)

- Last night of Science Operation
  - APEX: March 18 (no science operations after shutdown period)
  - La Silla: NTT and 3.6m March 22
  - Paranal; VLTI & UTs March 24; VST March 23; VISTA March 16

- Safe State of all sites reached on **March 27**

- Planning for future ramp-up ongoing
  - Safe state to Restricted Operations
    - Depends primarily on availability of safe travel and successful implementation of e.g. social distancing at workplaces
    - Requires about three weeks (for Paranal)
    - Results in basic science operations with selected telescopes and instruments in Service and designated Visitor Mode
  - Restricted to Full Operations
    - Requires at least another week once full staffing is reached
    - Results in full science operations (w/o Visiting Astronomers)
  - Technical activities requiring presences of external teams (like AIV and commissioning activities) will primarily depend on constraints on international travel
Updates Paranal
Planned upgrades during P103

- Upgrade of Safety-Chain ("Lock-out") System
- Upgrade of Drive system
- Recoating of M1
  - First coating since 2011 with upgraded coating facility
  - After stripping of Aluminum several damaged lateral pads found during visual inspection
  - Repair procedure established and pads repaired (2 weeks delay)

![Correct](correct.jpg)
![Damaged](damaged.jpg)
Instrumentation news

- **SINFONI**
  - decommissioned end of June 2019 after 16 years of operation
  - SPIFFI (IFU) transferred to Europe for upgrade and integration in ERIS

- **NACO**
  - decommissioned end of September 2019 after 17 years of operation
Decommissioning activities

Ø SINFONI decommissioned end of June 2019 after 16 years of operation

Ø NACO decommissioned end of Sept. 2019 after 17 years of operation
Double instrument move: X-Shooter to UT3 and VISIR to UT2 before start of P105

- Root cause for move is the unbalanced time request between UT2 and UT3. CfP P105 requests yielded (see details next slide):
  - Continued low time demand on UT3 instruments (end of SPHERE GTO, delayed CRIRES+ commissioning).
  - X-S demand (originally on UT2 for P105) continued to be very high

- Move of X-S to UT3 decided after the CfP, to re-balance time pressure across UTs.

- Situation at present:
  - X-Shooter on UT3: instrument installed; re-commissioning pending
  - VISIR on UT2: CAS cable wrap installed; instrument not yet installed
  - CRIRES+ on UT3: warm part commissioned; cold part installed but commissioning pending
## Instrumentation news

- **Double instrument move:** X-Shooter to UT3 and VISIR to UT2 before start of P105

  - Improved time balance:

<table>
<thead>
<tr>
<th>Instrument Set</th>
<th>UT1</th>
<th>UT2</th>
<th>UT3</th>
<th>UT4</th>
</tr>
</thead>
<tbody>
<tr>
<td>KMOS+FORS2</td>
<td>3717.5</td>
<td>4196.9</td>
<td>2768.1</td>
<td>4354.0</td>
</tr>
<tr>
<td>KMOS+XSHOOTER</td>
<td>4858.3</td>
<td>5337.7</td>
<td>3908.9</td>
<td></td>
</tr>
<tr>
<td>KMOS+VISIR</td>
<td>2180.8</td>
<td>2660.2</td>
<td>1231.4</td>
<td></td>
</tr>
</tbody>
</table>

**P104 (even)**
- KMOS+FORS2: 3717.5
- KMOS+XSHOOTER: 4858.3
- KMOS+VISIR: 2180.8

**P105 (odd)**
- KMOS+FORS2: 3717.5
- KMOS+XSHOOTER: 4858.3
- KMOS+VISIR: 2180.8

**P106 (Oct 2021 - Mar 2022)**
- KMOS+FORS2: 2574.0
- KMOS+XSHOOTER: 3704.8
- KMOS+VISIR: 1184.1

**P107 (Apr 2022 - Sep 2022)**
- KMOS+FORS2: 3024.0
- KMOS+XSHOOTER: 4154.8
- KMOS+VISIR: 1634.1

**P108 (Oct 2022 - Mar 2023)**
- KMOS+FORS2: 4917.5
- KMOS+XSHOOTER: 6058.3
- KMOS+VISIR: 3380.8

**P109 (Apr 2023 - Sep 2023)**
- KMOS+FORS2: 4904.8
- KMOS+XSHOOTER: 4904.8
- KMOS+VISIR: 2384.1
Instrumentation highlights

- **FORS2**
  - Imaging and spectroscopic data now fully compatible with ESO’s Science Data Products (SDP) standard and ready for IDP creation

- **SPHERE**
  - Reference star differential imaging: 11-12 mag contrast at 0.1"

- **MUSE**
  - NFM: Strehl ratio improved by a factor of 2: newly determined GALACSI control matrix
  - AOF: downtime continues to decrease, from 5.0% to 1.2% over the past 6 months

- **GRAVITY**
  - Two new high performing grisms: throughput increased by factor of 2
Instrumentation highlights

- MATISSE
  - new high-resolution L-band prism (R=3300) installed and commissioned
  - Call for SV with GRA4MAT mode issued; mode offered for P106

- PIONIER
  - First polarimetric measurements achieved

- ASM
  - ESO meteo data delivered for use by the Chilean Meteorological Service
  - Installation, commissioning of 3rd radiometer: NIST standard star project
Instrumentation concerns

X-Shooter

- Intermittent failures of the ADC over past 2 years
  - **100h of science data affected**

- Causes & actions
  - Bushings in the driver mechanism were broken in all four units
    - new bushing manufactured and installed
  - Software did not report any error on failure
    - changes to the SW have been applied

- Further actions
  - Painstaking work to identify affected data
    - Required reverse engineering based on log files
  - PI of all affected data contacted and asked to check if scientific objectives could still be reached (in which arm is the scientific information, is SED important?, etc…). If not:
    - for not-closed A, B programmes, offer to compensate: 28h
    - for C or closed programmes, no compensation

- More generally, SW for all tracking devices (DROT, ADC, rotating retarder plates…) does not report failures.
  - change about to be implemented on 7 instruments in operation;
  - solution will be propagated to CRIRES+, ERIS, NIRPS.
Follow up of 2018 & 2019 UC recommendations

[2018] UC42.R14 RRM success rates
- Following this recommendation, as of P105 RRM is enabled for instruments not on focus
  - For science cases that can accept ~10-15 minutes delay between trigger and observation
  - Start in P105 with UT2 & UT3 (e.g. X-S, UVES)

[2018] UC42.R09 La Silla remote observing
- Eavesdropping will (have to) be implemented as soon as ESO restarts observing at La Silla. Expectation for this to happen in P105.

[2019] UC43.R06 Provide NIR colour transformations for ESO instruments to a common filter set
- Published for VIRCAM, HAWK-I, ISAAC, SOFI in http://www.eso.org/sci/data-processing/faq.html
- Messenger article in preparation (Coccato et al. 2020)
[2019] UC43.R09 To ensure all visitor mode users have immediate access to their data

- Understood as request for designated visitor mode (since for visitor mode on site, direct access possible).
- Following this recommendation, ESO has increased priority of raw data transfer for dVM to the highest level, equal to ToO.
- Median delay of 10 minutes between taking data and arrival to archive.
  - Maintenance activities outside of ESO’s control can affect transfer rates
  - If real-time (seconds or few minutes) data analysis is critical, physical presence visitor mode is recommended.
- UC is asked to provide a priority for considering also reduced data for this transfer to the archive.
Since December 2019, to enable more efficient cross-telescope workflows and support

Proof of concept for integrated operations towards ELT era
Turbulence forecast

- Call for tender for ‘Forecast system for the turbulence and meteorology at the Paranal Observatory’
  - Released in January 2020
  - To forecast crucial meteo parameters for up to 3 days (e.g. seeing, coherence time, wind, ..)
  - Turbulence forecast is ELT top level requirement

- Several offers received; validation in Q3/2020

- To be managed at PSO by new role of Atmosphere Scientist
  - Hiring process ongoing
Nowcast (seeing prediction):

- 2020 Q2 & Q3: Proof-of-concept continuation for AI supported prediction of seeing evolution in the next hours
- Parallel study of seeing triangulation between nearby sites
- 2021: put Nowcast 1.0 into VLT operations: 2-3hr forecast based on available sensor data
- 2021-2024 mid-term evolution, both with Microsoft and other partners:
  - Include spatially distributed sensor data into forecast (possible involvement of Microsoft Research)
  - Include mid-term (2-3 day) forecast (see previous slide)
- 2024: Implement full forecast into operations
AI supported image anomaly detection:

- 2020: put into production for UVES
- 2021: put into production for two more instruments
- 2024: in production for all/most VLT instruments (?)
The evolution of QC in a 2-year time-scale (nutshell):

- PSO takes over Quality Control tasks from Garching QC group (“QC1 process”):
  - create master calibrations, score calibration data for completeness, monitor instrument health and performance

- PSO and partners will develop “science data scoring” at the VLT, catering to ELT top-level requirements and improving service to users

- Implementation plan expected in Q4/2020
Satisfactory visitor mode run completion rates

- After excellent P100 & P101, now back to average rates (and average weather downtimes)
Continued high level of satisfaction with support from astronomer and TIO
Hint of increased on-line pipeline use continues

Possibly due to decrease of GTO and PS fraction
Possible trend of less satisfaction with food & lodging up to P101 did not continue

Increase of N/A, due to increase of dVM with P104
Updates La Silla
NTT Visitor Instruments

- CUBE @ NTT NAS
  - allows three VIs to be mounted simultaneously

![Diagram showing CUBE @ NTT NAS with ports labeled: 1st Port: EFOSC2, 2nd Port: ULTRACAM, 3rd Port: CUBE: M4 mechanism]
**NTT Visitor Instruments**

- **CUBE @ NTT NAS**
  - Commissioned with EFOSC2 & ULTRACAM in Sept 2019

1. **1st Port**: EFOSC2
2. **2nd Port**: ULTRACAM
3. **3rd Port**
NIRPS@3.6m Commissioning

- Front End Commissioning
  - November 26 – December 6, 2019
  - East Coudé room as AIV space
NIRPS@3.6m Commissioning

- Front End Commissioning
  - Test observing with new guiding system
  - First tests of adaptive optics module
La Silla Data Flow System fully aligned with Paranal

- Same tools, same database, same infrastructure
- Support P2 APIs for programmatic preparation of OBs, advanced dVM for upcoming instruments, remote observing via LOEM

Old P2PP

- fully retired
La Silla Observing School

Successfully carried out in February 2020

- 100 applications
- 20 students selected
- Courses in Vitacura, Observations at La Silla (2n @ NTT)
- 6 tutors
- 18 lecturers
Hosted Telescope Projects

Recent new projects

- ESA/TBT
- ExTrA
- MASCARA
- BlackGEM
Hosted Telescope Projects

BlackGEM

- 3rd dome and telescope installed
Hosted Telescope Projects

TBT/ESA

- Dome installed
- Telescope still in warehouse
- Camera with problems; sent to US for repair
Three Pillars

- 3.6-m telescope with HARPS + NIRPS
  - Exo-planet machine
- NTT with SoXS (+ Visitor Instruments)
  - Transient machine
- Hosted Telescope Projects
  - Taking advantage of existing infrastructure
  - Simple interfaces, quick deployment possible

LS 2020+ plan developed in 2019

- Considering the retirement of key staff 2021-2024
- Considering the requirements of new instruments
- Considering the requirements of hosted telescopes
Evolution of LS 2010+ operation mode

Science Operation
- Confirmed as ESO’s core activity
- Alignment with Paranal operation tools (e.g. p2)
- Enable remote participation in observations (e.g. LOEM)
- Enable advanced dVM for SOXS and NIRPS with operation support by consortia (e.g. using p2 APIs)

Technical and Site Operation
- Modernise maintenance planning and activities
- Move from
  - 1 ESO supervisor + 6 ESO engineers & technicians + low-level service contract
  to
  - 2 ESO lead engineers + high-level service contract
- Status of new service contract
  - RFI successfully completed in 2019, 5 companies responded
  - Preparation of SoW and CfT ongoing
  - Transition to new contract in 2021
Updates APEX
Operations Statistics

- Total of 4468 hours on sky in 2019
Panel de-stressing
- All 48 sections of the cladding were removed in order to gain access to the rear section of the panel.
- Rings 4 and 6 were de-stressed by VERTEX staff in week 10 / 2020.
- Ring 5 de-stressed by APEX staff.

Surface pressing
- 5 iterative pressings were conducted on the dish.
  - The first four to compensate the large misalignment caused by the de-stressing procedure.
  - The last one was a full dish pressing to bring the dish to below 13 microns.

Holography to follow
- during ramp-up taking advantage of ALMA not being operated
Antenna dish surface

Residual maps

After de-stressing of rings 4-6

After full dish-pressing
nFLASH 230/460
- Pre-shipment review
  - 21 Dec 2019. Dual colour capability not available since the beginning (dichroic).
- Installation by MPIfR and functionality tests in second half of January.
- First light on-sky 19 Jan 2020
  - Offset between 2 polarisations in 230 channel, and a smaller offset between two colour beams.
  - One polarisation shows some time-instability.
- Second visit in mid-March to warm-up, modify the alignment of 230 channel polarisations and check internal IF chain to fix time-instability.

SEPIA 345
- Pre-shipment review
  - 14 Jan 2020. For one of the polarisations, Trx performance is lower than requirements.
- Installation by GARD team and functionality tests Feb 13 – 21.
- On Feb 18 the SEPIA cryostat with all three bands was cooled down.
- The commissioning work on site was started on Feb 25.

SEPIA 660
- Tests done by NOVA group in Jan-Feb to investigate standing waves reported in 2019.
- Tested modified bias points and mechanical interface between CCA and WCA. Shipped back to APEX on Feb 7.
- Team at APEX Feb 15-22 for installation and testing. On-sky tests not possible due to weather conditions. Technical tests suggest an improvement but needs to be verified on sky.
Thank you!

Paranal Greening for St. Patrick’s Day 2020