



# **ESO Call for Proposals – P100**

**Proposal Deadline: 30 March 2017, 12:00 noon CEST**



# **Call for Proposals**

## **ESO Period 100**

**Proposal Deadline: 30 March 2017,  
12:00 noon Central European Summer Time**

**Issued 28 February 2017**

Preparation of the *ESO Call for Proposals* is the responsibility of the ESO Observing Programmes Office (OPO). For questions regarding preparation and submission of proposals to ESO telescopes, please contact the ESO Observing Programmes Office, [opo@eso.org](mailto:opo@eso.org).

The ESO Call for Proposals document is a fully linked pdf file with bookmarks that can be viewed with [Adobe Acrobat Reader](#) 4.0 or higher. Internal document links appear in red and external links appear in blue. Links are clickable and will navigate the reader through the document (internal links) or will open a web browser (external links).

*ESO Call for Proposals Editor*: Gaitee A.J. Hussain

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## Preface

ESO released the first Call for Proposals for observing time on the 1-m Photometric Telescope at La Silla in 1968 via [ESO Bulletin No. 4](#). Period 100 will mark the completion of the first half-century of community use of the instruments and telescopes that are offered by what is now called the La Silla Paranal Observatory. In the intervening years the set of instruments and telescopes offered to the community has continued to grow in both number and scope, with a new era starting in Period 63, when time was first offered on the Very Large Telescope. Every six months nearly 1000 observing proposals are submitted and subsequently ranked by the Observing Programme Committee and its panels. Telescope time is highly oversubscribed, and only the most promising proposals can be scheduled. These have resulted in many scientific discoveries, leading to nearly 900 refereed papers per year based on data obtained at ESO. This positive trend will continue in the future as new instrumentation and telescopes are added to ESO's programme, including the 39-m diameter Extremely Large Telescope, which is on track for first light in 2024.

Tim de Zeeuw

## Part I

# Phase 1 Instructions

## 1 ESO Proposals Invited

The **European Southern Observatory (ESO)** invites proposals for observations at ESO telescopes during Period 100 (**1 October 2017 – 31 March 2018**). The following instruments are offered in this period:

### La Silla

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[EFOSC2](#) (ESO Faint Object Spectrograph 2)  
[HARPS](#) (High Accuracy Radial velocity Planetary Searcher)  
[SOFI](#) (Son of ISAAC)  
[ULTRACAM](#) (high speed, three channel CCD camera)

### Paranal

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[AMBER](#) (Near-infrared interferometric instrument)  
[FLAMES](#) (Fibre Large Array Multi Element Spectrograph)  
[FORS2](#) (FOcal Reducer/low dispersion Spectrograph 2)  
[GRAVITY](#) (K-band instrument for precision narrow-angle astrometry and interferometric imaging)  
[HAWKI](#) (High Acuity Wide field K-band Imager)  
[KMOS](#) (K-band Multi-Object Spectrograph)  
[MUSE](#) (Multi Unit Spectroscopic Explorer)  
[NACO](#) (NAOS-CONICA: High Resolution NIR Camera and Spectrograph)  
[OMEGACAM](#) (Wide Field Imager for the VST at Paranal)  
[PIONIER](#) (Precision Integrated-Optics Near-infrared Imaging Experiment)  
[SINFONI](#) (Spectrograph for INtegral Field Observations in the NIR)  
[SPHERE](#) (Spectro-Polarimetric High-contrast Exoplanet REsearch)  
[UVES](#) (UV-Visual Échelle Spectrograph)  
[VIMOS](#) (Visual Multi-Object Spectrograph)  
[VIRCAM](#) (VISTA InfraRed CAMera)  
[VISIR](#) (VLT Imager and Spectrometer for mid Infra Red)  
[XSHOOTER](#) (UV-Visual-NIR medium resolution échelle spectrograph)

### Chajnantor

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[ARTEMIS](#) (Architectures de bolomètres pour des Télescopes à grand champ de vue dans le domaine sub-Millimétrique au Sol)  
[LABOCA](#) (Large Apex BOLometer CAMera)  
[SEPIA](#) (Swedish ESO PI receiver for APEX)  
[SHFI](#) (Swedish Heterodyne Facility Instrument)  
[FLASH](#) (First Light APEX Submillimeter Heterodyne receiver)

Further information can be found via the [Phase 1 webpage](#). Details on the instruments and ESO facilities offered in Period 100 can be found on the La Silla Paranal Observatory [Call for Proposals](#) webpage. The main characteristics of all Period 100 instruments offered at La Silla, Paranal and Chajnantor are described in the [Instrument summary](#) table. Useful information about Phase 1 can be accessed from the [Important Links](#) webpage (e.g., telescope pressure and definitions of observing constraints). Any updates after the release of this Call will be listed on the [Late Breaking News](#) webpage.



The ESO proposal submission deadline is:

**30 March 2017,  
12:00 noon Central European Summer Time.**

Please note that it is the PI's responsibility to resolve any verification or upload problems related to the instrument configuration, LaTeX file or associated figures well before the deadline. ESO cannot provide support beyond 11:00 CEST on the day of the deadline. The online receiver will switch off at 12:00 CEST. No submissions or amendments to submitted proposals can be accepted after this time.

In each submitted proposal, one single person, the Principal Investigator (PI), must be primarily responsible for that proposal. By submitting a proposal the PI agrees that he/she and his/her collaborators will act according to ESO's policies and regulations (including the conditions specified in the present Call for Proposals) if observing time is granted.

Any questions about policies or the practical aspects of proposal preparation should be addressed to the ESO Observing Programmes Office, [opo@eso.org](mailto:opo@eso.org). Enquiries related to the technical requirements of the planned observations should be sent to the User Support Department ([usd-help@eso.org](mailto:usd-help@eso.org)) for Paranal and Chajnantor and to [lasilla@eso.org](mailto:lasilla@eso.org) for La Silla.

This document outlines the main news concerning the call, provides guidelines on how to prepare an ESO observing proposal, and outlines the policies related to ESO programmes. All the technical details related to the available facilities, telescopes and instruments are available through the ESO webpages. Part I of this Call for Proposals provides information on how to complete and submit a Phase 1 proposal to ESO and Part II describes the policies and procedures regarding proposing for, carrying out, and publishing ESO observations.

ALMA proposals are handled through a separate channel. Further details are available via the [ALMA Science Portal at ESO](#).

## 1.1 Important recent changes (since Periods 98 and 99)

This section describes important changes which took place during Periods 98 and 99, as well as expected changes during Period 100.

- **General changes**

- **Recent changes:** News items related to the technical capabilities of the ESO instruments can be found via the [Recent Changes in Instrumentation](#) link.
- **Scientific categories A and B:** Please note that there has been a change in the scientific categories A (“*Cosmology*”) and B (“*Galaxies and Galactic Nuclei*”), following the recommendations of the Observing Programmes Committee. Specifically, the B9 category, “*AGN host galaxies*”, has been moved to A9, “*Surveys of AGNs and AGN host galaxies*”. The category, A1, has also been redefined to “*Surveys of high-z galaxies*”. The updated lists can be found on the [OPC Categories](#) page and in the ESOFORM User Manual.
- **Monitoring Programmes:** Monitoring Programme proposals enable users to request a limited amount of time to monitor targets over more than one Period. Proposers should use the normal proposal template with the appropriate macro in order to apply for a Monitoring Programme. See Section 4.2 for the detailed definition of a Monitoring Programme, the instruments offered for this programme type, and any associated restrictions. No Monitoring Programmes are allowed on La Silla telescopes, VISTA or VST in this call. On the APEX and Paranal telescopes, Monitoring Programmes are subject mostly to the same instrument restrictions as Large Programmes (see below).
- **Large Programmes:** See Section 4.3 for the detailed definition of a Large Programme and the instruments offered for this programme type.

The following VLT/VLTI instruments are unavailable for Large Programmes: NACO, VIMOS, VISIR, SINFONI, AMBER. The reasons for these restrictions are listed below and apply to Monitoring Programmes as well:

- \* the availability of several modes on NACO cannot be guaranteed in the coming Periods;
- \* in order to free a Nasmyth platform for the upgraded CRIRES in Period 101 VIMOS will be decommissioned late in Period 100 or early in Period 101;
- \* VISIR may undergo modifications and temporarily replace SINFONI on UT4 in 2019 for a specific experiment of limited duration (also see Section 1.3);
- \* AMBER will likely be decommissioned after Period 101, to make space for a visitor focus in the VLTI laboratory. ESO therefore encourages AMBER users to utilize Periods 100 and 101 in order to complete any ongoing programmes.

As in previous Periods, Large Programmes will not be accepted for VIRCAM. Large Programmes are accepted for OMEGACAM that can effectively use poor weather conditions: also see item on “Any weather proposals” in Section 1.2.

On the APEX telescope, Large Programmes will only be accepted for SEPIA and ARTEMIS.

- **Guaranteed Time Observations proposals:** GTO programmes arise from contractual obligations between ESO and external consortia that build ESO instruments. GTO teams can use the Large Programme template of the ESOFORM to request up to four Periods, provided that this is compatible with the corresponding GTO agreement. PIs should note that any GTO proposal requesting time through the Large Programme channel is subject to the same requirements to provide a detailed delivery plan for data products and other conditions governing the reporting on the progress of Large Programmes. If the GTO programme time request is for under 100 hours and only requires time in Period 100, the GTO team should fill in a Normal Programme template form specifying the GTO programme type and the appropriate GTO contract keyword as usual. Further information can be found in Section 4.5.
- **Guaranteed Time Observations (GTO)** will be carried out in Period 100 with **GRAVITY** on the UTs and ATs, as well as with **KMOS, MUSE, NACO, SINFONI, SPHERE, OMEGACAM, ARTEMIS and ULTRACAM**. For details about the protected targets, please see: <http://www.eso.org/sci/observing/teles-alloc/gto/100.html>.

- **La Silla**

- Additional information regarding changes affecting La Silla instruments and facilities can be found at the [La Silla Paranal Observatory Call for Proposals webpage](#).
- **3.6-m:** Approximately 15% of the available science time is committed to ongoing large programmes in Period 100 (see the [Telescope Pressure](#) webpage). New Large Programmes for the 3.6-m telescope are therefore invited for this Period.
- **NTT:** A significant fraction of the available time on the NTT is committed to ongoing Large Programmes (~ 35%), particularly in dark and grey conditions. Bright time is generally undersubscribed and proposers should consider whether their science case can successfully exploit these conditions.
- **HARPS:** Regular operations with the Laser Frequency Comb are expected to become possible during Period 100. Availability of the Laser Frequency Comb and instructions for its use will be announced in the [HARPS News](#) web page.
- **ULTRACAM:** ULTRACAM is a high-speed imaging photometer designed to study faint astronomical objects at high temporal resolutions. ULTRACAM employs two dichroic beamsplitters and three frame-transfer CCD cameras to provide optical imaging with a field-of-view of 6' and at frame rates of up to 300 Hz simultaneously in the u'g'r', u'g'i' or u'g'z' bands.

This PI instrument is offered to the ESO community for up to 5% of the observing time at the NTT in Period 100. Large Programmes will not be accepted. Operation of this PI

instrument requires the presence of the instrument team so all ULTRACAM observations will be scheduled on fixed dates; the exact dates in Period 100 have not been determined yet. For questions on the instrument and observation strategies, users shall contact the instrument PI, Prof. Vik Dhillon (vik.dhillon[AT]sheffield.ac.uk), at least two weeks prior to submitting their proposal.

The ULTRACAM consortium is committed to support the PIs and observers from the ESO community that have been awarded observation time with the ULTRACAM instrument during the execution of the observations and the subsequent data reduction to allow the scientific exploitation of the data obtained with the ULTRACAM instrument. Proposers must check that their planned observations do not duplicate any protected targets specified for ULTRACAM via the [P100 GTO target protection webpages](#).

- **Paranal**

- Information regarding changes affecting Paranal instruments and facilities can be found at the [La Silla Paranal Observatory Call for Proposals webpage](#).
- **Distribution of VLT instruments:** In Period 100 the distribution of offered instruments on the UTs will be: UT1 (FORS2 + KMOS + NACO), UT2 (FLAMES + UVES + XSHOOTER), UT3 (SPHERE + VIMOS + VISIR), UT4 (HAWKI + MUSE + SINFONI).
- **Excellent condition proposals:** Seeing at Paranal is better than 0.5'' approximately 5% of the time, while episodes of precipitable water vapor smaller than 0.5mm are encountered 6 to 7 nights per year (see [Kerber et al. 2014, MNRAS 439, 247](#)), mostly during the southern winter. ESO encourages the unique science that can be carried out under one or both of these conditions, which should be stressed in the `\SpecialRemarks` macro in the ESOFORM proposal form. Users requiring excellent seeing conditions should specify 0.4'' in the `\ObservingRun` macro in their proposal.
- **P2PP in Visitor Mode:** ESO is modifying the Phase 2 preparation tool (p2pp) and visitor Observing Tool (vOT) used by visiting astronomers at Paranal in order to allow for more agile preparation and execution of Visitor Mode observations. A successful trial at UT2 Kueyen took place during Period 98 and commissioning will be extended in Period 99 to include Visitor Mode observations on the other UT telescopes. In the future, further modifications will encompass Service Mode observations as well as the possibility to create and modify OBs and execution sequences using scripts rather than via a user interface. Further details will be provided through the [Paranal Science Operations](#) webpage
- **VLT-XMM proposals:** It will not be possible to apply for VLT-XMM time in Period 100; proposals under this scheme will be invited again in Period 101.
- In contrast with earlier periods, observations with [NACO](#) should preferably be executed in Service Mode, unless they require SAM/SAMPOL configurations. PIs requesting Visitor Mode for the other observing modes should carefully justify their request.
- [XSHOOTER](#): a re-designed Atmospheric Dispersion Corrector (ADC) will be installed early in Period 99: see the [XSHOOTER News](#) page for update. Large and Monitoring Programmes are accepted in Period 100.
- Rapid Response Mode (RRM) for [SPHERE](#) is offered for the first time in Period 100. It is restricted to ZIMPOL in imaging and polarimetry modes, IRDIS in classical imaging mode and IRDIFS in imaging mode
- **Any weather proposals on UT3 - Melipal:** Since seeing conditions for observations with [SPHERE](#) must be better than 1.2'', and as VIMOS public surveys also require seeing better than 1.0'', Service Mode programmes that require 1.2'' seeing or worse are actively encouraged for [VIMOS](#) or [VISIR](#). This includes the RA ranges that are covered by the ongoing Public Spectroscopic Surveys (see below).
- [VIMOS](#): Public Spectroscopic Surveys started in Period 94 and use all the dark and grey time in good conditions (PHO/CLR, seeing < 1.0'') in RA ranges 00-05:30h and dark time in RA ranges 08-12h (also see the [Public Survey](#) webpages). Service Mode filler programmes that require 1.2'' seeing or worse and/or bad transparency are actively

encouraged, but will not be carried over as the instrument will be decommissioned in late Period 100 or early Period 101.

- **VISIR**: As described above, VISIR is not available for Large and Monitoring programmes in Period 100.

– **Activities related to the installation of the Adaptive Optics Facility on UT4 – Yepun**

The commissioning of the Adaptive Optics Facility (AOF) and AOF-related systems requires 5-7 day slots monthly or 10-15 day slots bi-monthly in Period 100.

- \* The **Laser Guide Stars Facility** was installed and commissioned during Periods 97 and 98.
  - \* The installation of the **Deformable Secondary Mirror** and re-commissioning of the telescope took place during the first half of Period 98.
  - \* The installation and a first commissioning run of **GALACSI**, the adaptive optics module for MUSE, takes place during the second part of Period 98. Further commissioning of **GALACSI** alone and commissioning of MUSE in the Wide Field mode with AO will take place during Period 99. This combination will be offered in Period 101, with the possibility that some programmes be executed late in Period 100.
  - \* Commissioning of HAWK-I+ **GRAAL** in GLAO mode will start during Period 100.
- The installation and commissioning of the Coudé trains for **ESPRESSO** started during Period 97 and are expected to be completed during Period 99. The spectrograph installation and commissioning are expected to start during Period 100 and will continue in Period 101.
  - No focus is available for a **Visitor Instrument** on the VLT in Period 100.
  - **VLTI**:

- \* ESO aims to increase the fraction of Service Mode for VLTI observations. PIs requesting Visitor Mode for VLTI should carefully justify their request.
- \* Proposers should be aware that there is a **minimum time limit of 1 night** per baseline configuration for Visitor Mode runs requiring VLTI-AT observations. Proposers requiring shorter runs per baseline configuration should specify Service Mode observations. These restrictions do not apply to the VLTI-UT baselines.
- \* **GRAVITY** is a four-telescope beam-combination instrument for the VLTI, operating in the K band, with three different spectral resolutions. It provides a spectro-imaging mode as well as an astrometric mode. **GRAVITY** uses its own fringe tracker to stabilize fringes on- or off-axis.

ESO offers **GRAVITY** on all AT configurations as well as on all four UTs with the visible adaptive optics system (MACAO), in Service Mode only. In Period 100 the spectro-imaging mode will be available, in single and in dual-field mode at low, medium and high-spectral resolution.

In addition to the instrument itself, the four units of the GRAVITY Coudé Infrared Adaptive Optics (CIAO) system for the VLT Interferometer have been installed and commissioned for Galactic Center observations on each of the four UTs and only available for GTO observations. Commissioning of the CIAOs for general purpose observations is still continuing. It is expected that the off-axis mode of CIAO will be offered in Period 101 and the CIAO on-axis mode in Period 102.

Limiting magnitudes have been updated at both the bright and faint ends following performance assessment during commissioning (see the **GRAVITY instrument description** web page).

Commissioning of the astrometric mode on both ATs and UTs with CIAO will continue in Period 100.

- \* The refurbishment of each of the 4 ATs continues during Period 99 in order to increase the throughput of their optical Coudé trains as well as to improve their operational reliability significantly. New limiting magnitudes will be assessed at the end of the intervention.
- \* No operations will take place with the VLTI for approximately 1 month during the second part of Period 100, in order to carry out the following: the installation of the

Multi AperTure mid-Infrared SpectroScopic Experiment ([MATISSE](#)) in the VLTI laboratory, and the installation, verification and commissioning of the first of the New Adaptive Optics Module for Interferometry ([NAOMI](#)), the low order adaptive optics system for the ATs.

\* **VLTI Visitor Instrument:** No VLTI Visitor focus is available in Period 100.

- **Chajnantor**

- **Observing with APEX:** Information on the available APEX instruments and capabilities can be found on the [Observing with APEX](#) page. Additional information regarding changes affecting APEX instruments and facilities can be found at the [La Silla Paranal Observatory Call for Proposals webpage](#).
- **APEX:** For a detailed description of the APEX instrument capabilities and links to observing time calculators see the [APEX instrumentation page](#). Due to major maintenance activities on the telescope, there will be no science observations from October 2017 till March 2018. As a consequence, the ESO time slots for Period 100 are expected to be scheduled from 27 July to 9 August, and from 22 September to 1 October, 2017. The exact distribution of the observing time between the APEX partners can be found on the [APEX webpages](#). Time-critical observations should only be requested during the ESO runs.
- **LABOCA:** This 870 $\mu$ m bolometer array will be offered as usual in Period 100, but it may be superseded by a new bolometer array that has a wider field-of-view, A-MKIDS, in 2018. Hence, no Large or Monitoring Programmes will be accepted on LABOCA in Period 100.
- **ARTEMIS** has been offered since Period 98. In Period 100, both the 350 and 450 $\mu$ m channels are offered for simultaneous observations. This instrument is optimized for wide-field mapping of areas of at least 4'x2', and achieves similar mapping speeds at both wavelengths.

An observing time calculator is available at

<http://www.apex-telescope.org/bolometer/artemis/obscal/>.

- **SEPIA:** This instrument can house up to three ALMA-type receiver cartridges. Since Period 99, two receivers are available: a band 5 receiver covering 159 to 211 GHz, with dual polarization, sideband-separating (2SB) mixers; and a band 9 receiver (600 to 722 GHz) with dual polarization, double-sideband mixers. Both receivers are available for Normal, Monitoring and Large programmes. The band 9 receiver will be upgraded with 2SB mixers over the course of 2018, and a new dual-polarization 2SB band 7 receiver (260 to 370 GHz) will be installed.

Both band 5 and 9 receivers use the XFFTS backends, covering 4 GHz IF bandwidth. In the 2SB receiver of band 5, both bands are recorded, while in the DSB receiver of band 9, only one band is recorded. In both cases, there is a gap of 8 GHz between the image and signal bands. An observing time calculator for both bands is available on <http://www.apex-telescope.org/heterodyne/calculator/>.

- **SHFI:** All 3 receivers are offered in Period 100. These may be superseded in 2018 with the planned installation of new receivers in SEPIA and FLASH. Hence, no Large or Monitoring Programmes will be accepted on SHFI in Period 100.
- **FLASH:** This PI instrument is offered to the ESO community on a collaborative basis with MPIfR. Large programmes or time-critical observations will not be accepted on this PI instrument. Users who would like to use FLASH must contact the instrument PI, Dr. Rolf Guesten (rguesten[AT]mpifr-bonn.mpg.de), at least 2 weeks prior to submitting their proposal. Members of the PI team should be included as CoIs on the proposal.

The operation of this PI instrument requires the presence of the instrument team so all ESO FLASH observations will be scheduled on fixed dates; the exact dates have not been determined yet.

FLASH observations will be done by the PI team over a maximum of 3 days. Preference will be given to proposals using the dual-beam, wide-bandwidth capabilities of FLASH due to the limited ESO observing time.

- [CHAMP+](#): This MPIIR PI instrument is not offered in Period 100, because of a planned technical intervention. It may be offered again in Period 101.
- [SABOCA](#) is not offered in Period 100 as the same capabilities are offered by ARTEMIS.

## 1.2 Important reminders

### • General information

- **ESO User Portal:** Proposals are submitted via a web upload procedure using the online tool, Web Application for Submitting Proposals (WASP). This requires users to first log in to the ESO User Portal at: <http://www.eso.org/UserPortal> (see Section 2.2).
- **Any weather proposals:** ESO strongly encourages programmes that can effectively exploit the worst observing conditions on the VLT. More specifically, we solicit proposals that request  $> 1.2''$  seeing in the V band, thin-thick clouds and have no moon constraints on the four UTs, VLTI, VISTA and VST. These are particularly needed for VIMOS and VISIR (on UT3) and for the VST. When preparing these proposals PIs should be aware that only a fraction of their programme may be completed over the course of the semester. This is because these programmes will only be executed when the Service Mode queue is depleted of all higher-ranked runs.
- **Seeing and Image Quality:** The seeing information to provide **in Box 3 of the proposal form is the seeing in the V band at zenith**. This ensures that the scheduling tool uniformly takes the seeing into account. Service mode users for approved programmes will enter the Image Quality for the airmass and wavelength of interest required for their observations as a constraint during Phase 2. The article by Martinez et al. entitled “*On the Difference between Seeing and Image Quality*” in [Volume 141](#) of the ESO Messenger describes the meaning of these two quantities and further information can be found on the [Observing Conditions](#) webpage.  
The **Exposure Time Calculators** have been modified accordingly and clearly distinguish between the two quantities, using a slightly modified version of the formula given in the above article. The ETCs also report on the chances of achieving the input seeing conditions and the resulting image quality.
- **Exposure Time Calculators:** in addition to the change mentioned above, a number of ETCs are now using a new sky model developed as part of the Austrian in-kind contribution (see Noll et al. 2012, [A&A 543, 92](#), Jones et al. 2013, [A&A 560, 91](#) and [The Cerro Paranal Advanced Sky Model](#)).
- **Duration of one night:** Proposers are reminded that one night in Visitor Mode is defined to be 8 hours in even Periods and 10 hours in odd Periods on all ESO telescopes.
- **The information provided in the proposal is binding:** All observing runs must be executed as described in the proposal. Deviations from the proposal (either by observing different targets or by using different instrument modes or different constraints) may be allowed only under exceptional circumstances and after approval by ESO (see Section 6.5).
- **OPC evaluation of proposals:** Proposers should keep in mind the need for each OPC panel to cover a broad range of scientific areas. As a result, a particular proposal may not fall within the main area of specialisation of any of the panel members. Proposers should make sure that the context of their project and its relevance for general astrophysics, as well as any recent related results, are emphasised in a way that can be understood by their peers regardless of their expertise.
- **Proposal resubmissions:** If the proposal is a re-submission of an old proposal then the **OPC comments must be addressed** in this new submission.
- **Precipitable Water Vapour (PWV):** Users of VISIR and the APEX instruments in Service Mode must specify PWV as an observing constraint during their Phase 1 and Phase 2 preparation. Examples are shown in the ESIFORM package template files. Also see Section 2.2.

- **Observing conditions:** The definitions of the observing conditions for Phase 1 and Phase 2 can be found on the [Observing Conditions](#) webpage. Please note that the seeing is now defined as the seeing in the V band at zenith (see Section 1.1).
- **PI access to raw and reduced data via <http://archive.eso.org>:**  
The ESO Science Archive Facility (see link above) is the access point to all data obtained with ESO telescopes. Principal Investigators of Service and Visitor Mode programmes (and their data delegates) have access to their proprietary raw data as soon as the data have been ingested in the ESO Archive, which typically happens a few hours after the observations. This moment is when the proprietary period starts. Access to the data is provided through the ESO User Portal. The [CalSelector](#) archive service for VLT instruments combines the science files with any ancillary files that are needed to process the data, (e.g. acquisition images, calibrations, etc.).  
In addition to raw data, science grade data products are available on a monthly basis for the following instrument modes: UVES cross-dispersed (with and without the image slicer), X-shooter slit, HARPS, FLAMES-GIRAFFE (in MEDUSA mode), and MUSE. They are generated at ESO by running the corresponding data reduction pipelines in automatic mode and are subject to the same proprietary restrictions as the corresponding raw data they originate from, *i.e.*, for the duration of the proprietary period access is restricted to PIs and their data delegates. More information on the science data products and links to the query forms for the data access and download can be found here: [http://www.eso.org/sci/observing/phase3/data\\_releases.html](http://www.eso.org/sci/observing/phase3/data_releases.html).
- **The ESO Science Archive Facility (<http://archive.eso.org>):**  
The Science Archive Facility is the repository of all raw data collected at the La Silla Paranal Observatory. As mentioned in the previous point, during the proprietary period of typically one year only the PI and data delegate can access the data. On the expiration of the proprietary period, data become generally available. In addition to raw data, science grade data products are available on a monthly basis for a number of instrument modes. They are generated at ESO by running the corresponding data reduction pipelines in automatic mode and are subject to the same proprietary restrictions as the corresponding raw data they originate from, *i.e.*, for the duration of the proprietary period access is restricted to PIs and their data delegates. More information on the science data products and links to the query forms for the data access and download can be found at the [ESO Data Streams](#) webpage.
- **Duplications:** Proposers must use the [Science Archive Facility](#) to check if observations equivalent to the proposed ones have been performed already. Proposers must check that their planned observations do not duplicate Guaranteed Time proposals (see [GTO Plans for Period 100](#)) or ongoing [Public Survey](#) observations.
- **Public Surveys:** Several public imaging surveys are being carried out on the VISTA and VST telescopes. Seven new VISTA Public Surveys are starting in Periods 98 and 99 as the first generation of VISTA public surveys near completion.  
In addition, two public spectroscopic surveys are being carried on UT3 (VIMOS) telescopes. Further details on both the ongoing and completed Public Surveys are available on the ESO [Public Surveys Projects](#) webpage.
- **Overheads:** Proposals must include all overheads when computing the total observing time request for both Service Mode and Visitor Mode runs (see the [Overheads](#) webpage).
- **Non-standard observing configurations:** The use of non-standard instrumental modes, configurations or filters requires the prior approval by the ESO User Support Department. A detailed justification should be sent to [usd-help@eso.org](mailto:usd-help@eso.org) at least 2 weeks before the proposal submission deadline. If proposers wish to use non-standard filters on cryogenic instruments, further restrictions apply. See Section 6.2 for more details.
- **Backup programme:** Approval of a backup programme for Visitor Mode runs must be sought at least two weeks in advance of the observing run through the change request form as described in Section 5.1. Requests sent on shorter notice, in particular, less than 48 hours from the start of the run, may not be processed in time. In those cases, the corresponding data will not be accessible from the ESO Science Archive Facility until the request is approved.

- **[The ESO Science Data Products Forum](#)**: This is a platform that enables users of ESO instruments to share ideas, methods, software and data to assist with the preparation of science data products from ESO telescopes. Users are encouraged to contribute on any topic related to the reduction, calibration and analysis of science data from ESO instruments.

- **Paranal**

- **Observing mode on the VLT**: Departures from the observing mode requested by the proposers may be implemented by ESO so as to achieve a balanced distribution between Service Mode and Visitor Mode.

Proposers should request Service Mode for observations that benefit from the short-term scheduling flexibility allowed by this mode. Proposers may identify runs that lend themselves for observations in either Service or Visitor Mode by specifying one of the modes using the alternative run feature in Box 3 of the ESOFORM Phase 1 proposal form. Please note that if a certain instrument mode is offered exclusively in either Service Mode or Visitor Mode then this overrides these scheduling considerations.

- **Service Mode OBs**: Service Mode Observation Blocks (OBs) including all [overheads](#) can last up to a maximum of 1 hour. This rule also applies to concatenated OBs in most cases. Users are encouraged to read the [Service Mode rules](#) for more details. Longer OBs have to be specifically requested and justified at Phase 2 via a [waiver request](#), which is evaluated by the Observatory.
- **Pre-imaging for VLT instruments and modes**: A separate pre-imaging run must be specified in the proposal (to be executed in Service Mode). Failure to do so will result in the deduction of the time necessary for the pre-imaging from the allocation to the main part of the project (see Section 6.6).
- **Monitoring in Service Mode**: Monitoring a target in Service Mode in a particular Period is carried out on a best effort basis only, *i.e.*, a monitoring sequence in any particular Period may be interrupted by long periods of unsuitable weather conditions, Visitor Mode scheduling or telescope availability. All the time needed to monitor targets in one observing Period should be included in one single run, even if multiple targets/fields are required. This run can be split into single epoch observations using a time-linked series in version 3 of the [Phase 2 Preparation Tool](#) (P2PP) (see Section 5.2.1 for more information).
- **Rapid Response Mode (RRM)**: is offered for certain instrument modes on FORS2, UVES, XSHOOTER, SPHERE, SINFONI, HAWK-I and MUSE in Period 100. RRM observations that correspond to events with exceptional characteristics may be activated during either Service Mode or Visitor Mode runs, over which they have observational priority, unless the Service or Visitor mode runs involve strictly time-critical observations. See Section 4.4.1 for details on the RRM policies.
- **VISTA and VST**: Due to ongoing Public Surveys only a limited amount of open time is available on VISTA and VST; these observations are carried out in Service Mode over restricted Right Ascension ranges. Open time proposals should clearly justify the scientific goals and why they are not achievable through the scheduled public survey observations. Only those proposals that have complementary constraints and coordinate ranges with respect to public survey observations may be scheduled, as the highest priority is given to advance public surveys on these telescopes.  
As the VST also has a significant GTO commitment, Normal Programme and Large Programme proposals on the VST are restricted to filler programmes requesting poor weather conditions (*i.e.*, no moon constraints, seeing  $> 1.2''$ , thin/thick clouds). Target of opportunity proposals will also be considered for the VST and VISTA.
- **Calibration Plans**: ESO has implemented calibration plans for all Paranal instruments. The primary purposes of these plans are to assure data quality, monitor instrument performance and calibrate science observations. Based on these plans, calibration data are obtained for certain standard instrument modes on a regular basis. Paranal calibration data are reviewed on a daily basis by Paranal Science Operations and the Garching Data Processing and Quality Control group.



A brief summary of the calibration data is available online for each instrument, *e.g.*, for FORS2: [FORS2 Pipeline: calibration data](#).

Please read the appropriate user manual and online documentation carefully, as not all instrument modes and/or configurations are covered to the same level of detail by the current calibration plans.

- \* **Service Mode runs:** The calibrations specified in the respective Calibration Plans are obtained systematically by the Observatory and do not need to be requested by the proposers. Proposals for Service Mode runs should only request the time needed for their science observations and, if applicable, night-time calibrations (including all operational overheads) beyond those listed in the published Calibration Plans.
- \* **Visitor Mode runs:** Night-time calibrations are the responsibility of the visiting observer with the following exception: up to approximately 30 minutes per night will be used by the observatory staff to obtain standard ESO calibrations. The ESO-obtained data will be used to monitor instrument performance and to assure a baseline calibration accuracy within the ESO Science Archive Facility. ESO does not guarantee that these standard calibration data will be sufficient to calibrate the Visitor Mode science observations to the accuracy desired by the observer. Proposers should plan accordingly for Visitor Mode runs.
- **Data Reduction software:** In collaboration with the various instrument consortia, ESO has implemented data reduction pipelines for the most commonly used VLT/VLTI instrument modes. The ESO pipelines, including downloads and user manuals, can be found via the following page: [VLT/VLTI Pipelines](#).
- **Quality Control and Instrument Trending:** The ESO pipelines are used to monitor the performance of the various instruments and their temporal trends. Extensive information about Paranal data handling and processing (*e.g.* zero points, colour terms, wavelength solutions) is maintained on the [ESO Quality Control webpages](#).

#### • La Silla

- **Support during observing runs and transportation schedule:** A streamlined operation is in effect in La Silla. La Silla instruments are offered in Visitor Mode and Designated Visitor Mode. The latter is offered on a best-effort basis, please see Sec. 5.1.2 for more information. Technical and logistical support will be delivered as usual by ESO staff, but no specific support astronomer is assigned. Note that the [transportation schedule](#) to and from La Silla may have an impact on the arrival and departure days of the observers at the site. Please check the online instructions for [visiting astronomers](#) for more details.
- There is a **minimum length of 3 nights for runs** to be executed with La Silla telescopes. Proposals including La Silla runs with a duration of less than 3 nights will be rejected at submission time by the automatic proposal reception system, with the following exceptions:
  1. There is no minimum duration for runs to be carried out with Visitor Instruments (see Section 3). However, in order to minimise the overheads associated with their installation and removal, such instruments are normally scheduled in blocks including several contiguous runs; the length of these combined blocks is typically greater than 3 nights.
  2. On the NTT, users can apply for combined runs using both EFOSC2 and SOFI. The total duration of each of these runs must be at least three nights. The combined runs must be requested using the instrument name “SOFOSC”. Details are also available in the ESOFORM User Manual.
  3. There is no minimum duration for runs of Calibration Programmes.
  4. In some science cases, an exception could be made if the observing strategy complies with the requirements for Designated Visitor Mode observations at La Silla. Please see Section 5.1.2 for more details.

Note that the minimum duration requirement for La Silla is applicable to each individual run of a proposal involving a La Silla instrument (see Section 4 for more information

about the definition of “programme” and “run”). More generally, proposals for long runs are strongly encouraged on the La Silla telescopes. The splitting of runs into sub-runs that have durations of less than a half-night should be avoided as much as possible, as this may prove impossible to schedule.

- **Designated Visitor Mode (DVM) at La Silla:** DVM is offered at La Silla on a best-effort basis (also see Section 5.1.2). The 3-night minimum length per run remains. Due to the reduced operations at La Silla DVM is being offered on a best-effort basis with the following restrictions: generally only one DVM run can be executed each night, so only the highest ranked runs are likely to qualify; the time requested each night must be rounded up to the nearest tenth of a night (e.g., 0.1n rather than 0.07n); OBs scheduled in DVM must be submitted to [lasilla@eso.org](mailto:lasilla@eso.org) by the Phase 2 deadline. Please note that observations will be executed by a telescope operator and contact with the PI is therefore very limited.

If you would like to use DVM on either the 3.6-m telescope or the NTT you are requested to contact [opo@eso.org](mailto:opo@eso.org) well before the proposal submission deadline.

- **Pre-imaging:** Pre-imaging frames for EFOSC2 will have to be obtained at the beginning of the spectroscopic run. The resulting lower efficiency should be taken into account in the computation of the required execution time for the run.

In some cases, pre-imaging might be carried out during technical nights by the Observatory technical staff. Please contact [lasilla@eso.org](mailto:lasilla@eso.org) to check the feasibility of such observations for your programme.

- **Chajnantor**

- **APEX:** This telescope is offered in Service Mode only. In exceptional cases (e.g. moving targets), remote observing from Bonn (in collaboration with MPIFR) can be considered. Proposals requesting time from different APEX partners must mention the amount of time requested from MPIFR, Sweden or Chile in Box 5. Observations will be done for up to 24 hours per day, but users should be aware that afternoon conditions are often significantly worse than the conditions during the night or the morning. Observations using high frequency instruments (SHFI/APEX-3, ARTEMIS, SEPIA/band-9) should avoid the afternoon. APEX users should ensure that their proposal meets the following requirements:

- \* specify if time is requested from other APEX partners in the macro, `\SpecialRemarks` (Box 5);
- \* specify the requested PWV using the macro, `\Target` (Box 11), for their project to allow a better distinction between observations requesting a range of atmospheric transparencies;
- \* either indicate an appropriate off-source position or request time to find such a position if they wish to observe extended line-emitting regions;
- \* merge all observations for any APEX instrument into a single run (note that this also applies for the different receivers of SHFI and SEPIA). For Large Programmes this restriction should be understood as a single run per instrument and per Period. Separate runs should be specified for observations in different Periods.

### 1.3 Foreseen changes in the upcoming Periods

- The commissioning of the AOF and AOF-related systems will continue to require monthly 5-7 day slots or bi-monthly 10 to 15-day slots on **UT4** until Period 101.
- **CRIRES** is being transformed into a cross-dispersed échelle spectrograph. The upgraded instrument will replace **VIMOS** on the Nasmyth B of UT3 in 2018. As noted earlier, **VIMOS** is likely to be decommissioned towards the end of Period 100.
- **VISIR:** ESO is investigating the technical implications of a specific targeted experiment that requires the modification and installation of **VISIR** at the UT4 Cassegrain focus, temporarily replacing **SINFONI**, during the first semester of 2019. **VISIR** will not be

made available for open time during this period. Thanks to the improved image quality provided by the deformable secondary mirror, VISIR will then have the performance required to search for potentially habitable planets around  $\alpha$  Cen (also see the press release, [“VLT to Search for Planets in Alpha Centauri System”](#)).

- **SINFONI** is likely to be decommissioned during 2019 to allow the upgrade and integration of SPIFFI within **ERIS**, a high angular resolution camera and 3D spectroscopy using the AOF. ERIS is expected to be installed and commissioned during the first semester of 2020 at the UT4 Cassegrain focus.
- The commissioning of **ESPRESSO** is likely to continue in Period 101.
- **AMBER** will likely be decommissioned in Period 102.
- The commissioning of **MATISSE**, the Multi AperTure mid-Infrared SpectroScopic Experiment will require three 2-week runs during Period 101. It is expected that a similar amount will be required in Period 102.
- **GRAVITY**: GTO observations will continue during Period 101 and beyond. In particular, observations of the Galactic Center will take place using 5 nights in each monthly 10-night UT slot in Period 101.
- Installation, verification and commissioning of **NAOMI** modules #2, 3 and 4 will require approximately slightly more than 3 weeks for each AT which, as a consequence, cannot be used for operation. Although these activities are expected to take place at the same time as the GRAVITY GTO observations on the UTs, the VLTI-ATs can only be operated with 3 ATs for approximately 10 days each time, preventing operation with GRAVITY and limiting the use of PIONIER. An additional commissioning run of approximately 10 days will take place in the second part of 2018 to commission the operation of NAOMI with the VLTI-ATs.
- **ZEUS-2**: The redshift (z) and Early Universe Spectrometer (ZEUS-2) may be offered as a visitor instrument during future Periods. ZEUS-2 is a broad-band spectrograph covering 7 telluric windows covering 200 to 850  $\mu\text{m}$ . For details, see [Ferkinhoff et al. 2010](#).
- **LABOCA**: this 870 $\mu\text{m}$  bolometer array may be replaced by a camera with a wider-field, A-MKIDs, in 2018.
- **SHFI**: the three receivers in this instrument may be replaced by new receivers in SEPIA and FLASH with better sensitivity and broader bandwidth.

## 2 Getting Started

Observing proposals must contain a scientific case, a summary of the proposed observing programme, a list of desired instrument modes and configurations, a target list, and a precise definition of required observing conditions (seeing in V band at zenith, atmospheric transparency, lunar illumination, etc.).

In addition, a calculation of the number of hours/nights of observing time needed to accomplish the scientific goals must be carried out and summarized in the proposal. It is therefore important that proposers consult technical documentation or instrument experts regarding the instrument capabilities and sensitivities. The [overheads](#) webpage provides a summary table of all the overheads that should be accounted for. A more detailed computation can be obtained by running the [Phase 2 Preparation Tool](#) (P2PP) in tutorial mode.

The definitions of the observing conditions for Phase 1 and Phase 2 can be found on the [Observing Conditions](#) webpage, which also shows the probability of the combined sky transparency and seeing values being realised throughout the year at Paranal.

The following sections give some additional information and references that should be useful to proposers.

## 2.1 Exposure Time Calculators

Exposure Time Calculators (ETCs) for ESO instruments are accessible directly on the ESO Web. For La Silla and Paranal instrumentation:

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

Proposers of VLTI observations with AMBER and PIONIER should check the feasibility of their proposed observations with the visibility calculator, VisCalc, available from the [ETC page](#). Visibility calculations for GRAVITY are included in the dedicated GRAVITY ETC. At Phase 2, users are also encouraged to select a suitable calibrator star for their planned observations using the CalVin tool, which is also available from the above link.

For APEX instrumentation please go to:

<http://www.apex-telescope.org/instruments>.

Links to useful proposal preparation software tools (*e.g.*, the Object Observability Calculator, Airmass Calculator, Digitized Sky Survey) can be found at:

<http://www.eso.org/sci/observing/tools.html>.

Information on standard stars and sky characteristics, as well as additional tools, are available at

<http://www.eso.org/sci/facilities/paranal/sciops/tools.html>.

The parameters used by the ETCs are based on data collected during instrument commissioning and operations. The ETC parameters are frequently updated and changes will be reflected by the running “version number”. To help the observatory staff assess the technical feasibility of observations, proposers are requested to specify the version number of the ETC they used in the section “9. Justification of requested observing time and observing conditions” of their proposals.

Please check the ESO webpages for the ETC version to be used in Period 100. Please note that while the sky background values used in the ETCs generally reflect actual conditions on Paranal, they do not account for local effects such as the zodiacal light.

Service Mode proposers are reminded that the requested observing conditions are binding in Phase 2 (see Section 6.5). The ETC’s were modified in Period 96 and require the seeing in the V band at zenith in order to estimate the observing time necessary to complete the programme. Proposers should ensure that the observing conditions specified in the proposal are consistent with those used in the ETC. This is also true for the requested sky transparency and lunar phase. Non-photometric sky transparency can be simulated by adding 0.1/0.2 mag to the object magnitude for CLEAR/THIN-CIRRUS conditions respectively.

## 2.2 The ESIFORM Proposal package

All Phase 1 proposals must be prepared using the ESIFORM Proposal Package configured for Period 100 as the package is updated every Period. The ESIFORM package may be obtained by logging into the ESO User Portal following the instructions at:

<http://www.eso.org/sci/observing/phase1/esiform.html>

The “ESIFORM User Manual” in the proposal package describes in detail how to fill the L<sup>A</sup>T<sub>E</sub>X template, and the information required to prepare a valid proposal.

### 2.2.1 ESIFORM: Important notes

- **Definition of Service Mode and Visitor Mode runs:** An observing programme, as described in a single proposal, may consist of one or more runs. Multiple runs should only be requested for observations with different instruments and/or for different observing modes (*e.g.*, Service Mode, Visitor Mode or pre-imaging runs) and/or for differing observational conditions (*e.g.*, seeing, transparency). In particular, Service Mode runs **should not** be

split according to time-critical windows, or used to group targets according to their Right Ascensions. Proposers should split Visitor Mode observations at different epochs (e.g., due to different target RAs) into separate runs.

- **Scheduling constraints** must be specified correctly as the telescope schedules are prepared using software that relies on accurate constraints (Alves 2005, [The ESO Messenger, 119, 20](#) and Patat & Hussain 2013 in *“Organizations, People and Strategies in Astronomy 2” (OPSA 2)*, ed. Heck, p. 231). Observing/scheduling constraints that are not indicated or that are inaccurately specified in BOX 12 of ESIFORM are unlikely to be taken into account by the scheduler. **Retrofitting scheduling constraints after the release of the schedule is not possible.**
- **Precipitable water vapour (PWV) constraints:** PWV constraints must be specified for VISIR and all APEX instruments in the “Additional Notes” column of the Target macro. Please see the ESIFORM User Manual for more details.
- **Proposal resubmissions:** If the proposal is a re-submission of an old proposal then the **OPC comments must be addressed** in this new submission.

## 2.3 Proposal Submission

Proposals must be submitted in their final version by the submission deadline:

**30 March 2017,  
12:00 noon Central European Summer Time.**

Proposal submission is done via a web upload procedure that can only be accessed by logging into the ESO User Portal at:

<http://www.eso.org/UserPortal>.

Please note that the ESO deadline **will be strictly enforced**: users should plan accordingly. It is the PI's responsibility to resolve any verification or upload problems related to the instrument configuration, LaTeX file or associated figures early as ESO cannot provide support for proposal submissions after 11:00 CEST on the day of the deadline. Requests for submissions or amendments after the deadline will not be considered.

In order to efficiently verify and submit your proposal, please note that:

- **Postscript figures are not accepted.** The proposals are compiled using the pdfL<sup>A</sup>T<sub>E</sub>X package which accepts only PDF (up to version 1.4) and JPEG file formats. Please note that there is a size limit of 1MB for each figure to be uploaded.
- Always compile your proposal locally with pdfL<sup>A</sup>T<sub>E</sub>X. Some of the checks are made at the L<sup>A</sup>T<sub>E</sub>X level and checking your proposal in this way will save you time. If there are errors please read the output carefully in order to identify the problem.
- Further checks are made by the web software (“the receiver”), which uploads your proposal and checks that it complies with ESO's requirements. The receiver allows you to verify your proposal without actually submitting it. **You should take advantage of this feature to check that your proposal is technically correct well before the Phase 1 deadline.** This can be done by verifying a “skeleton” version of the proposal early; this version should contain all the technical details but not necessarily the full scientific description. This will ease the final submission process considerably.
- Plan ahead! Over past Periods, congestion of the proposal submission system has repeatedly occurred in the last few hours before the proposal deadline, leading to delays in response time that occasionally exceeded 1 hour. Try to submit proposals at least one day before the deadline and avoid last-minute stress.

At the end of the submission procedure an acknowledgment page is displayed with the Proposal ID. Please save this for your records. The PI of the proposal and the submitter will also receive a confirmation ticket via email, but **the acknowledgment page is the official receipt**. If you are not sure if your proposal has successfully entered the system, **do not** re-submit it but rather contact ESO at [esoform@eso.org](mailto:esoform@eso.org).

Neither proposals nor corrections to proposals that are submitted after the deadline will be considered.

### 3 Visitor Instruments

Visitor instruments can be mounted at the NTT, the 3.6-m and APEX telescopes in order to permit innovative observations by teams with their stand-alone instruments or to test new instrumental concepts for the development of new facility instruments.

No foci are available for visitor instruments on the VLT or VLTI in Period 100.

The requirements for visitor instruments are substantially reduced compared to the requirements for fully integrated facility instruments. A set of guidelines on how to propose a visitor instrument and technical information is available through the links below:

Technical information on the interface to the NTT and 3.6-m telescope is at:

<http://www.eso.org/sci/facilities/lasilla/instruments/visitor/VisitorInstruments.pdf>.

For visitor instruments on APEX:

<http://www.eso.org/sci/facilities/apex/instruments/apex-visitor/index.html>.

## Part II

# Proposal Types, Policies, and Procedures

## 4 Proposal Types

For Period 100 the list of proposal types is:

- Normal Programmes
- Monitoring Programmes
- Large Programmes
- Target of Opportunity
- Guaranteed Time Observations
- Calibration Programmes
- Director's Discretionary Time

All proposals except Director's Discretionary Time (DDT) proposals must be submitted by the current deadline. DDT proposals may be submitted at any time.

Only the Normal and Large Programme template forms should be used for the preparation of proposals. An observing programme, as described in a single proposal, may consist of several runs, *e.g.*, for observations with different instruments, or to be executed in different observing modes or at different epochs for Visitor Mode observations. Proposals for **Visitor Mode** observations (Section 5.1) must request time in nights, proposals for **Service Mode** observations (Section 5.2) must request time in hours. Note that any given proposal may request a mix of Visitor/Service Mode observations provided that they are split into separate runs. The definition of a single run differs for Service Mode and Visitor Mode observations; further guidelines are available in Section 2.2.1.

**Please note:** All proposers (Service and Visitor Mode) must include time for all overheads (telescope + instrument) in their proposals (see the [Overheads](#) webpage).

### 4.1 Normal Programmes

Most of the observing time on ESO telescopes will be allocated to **Normal Programmes** in Period 100. Proposers must use the standard L<sup>A</sup>T<sub>E</sub>X template (Section 2.2). The scientific case of the programme may take up to two pages including attachments (figures or tables). The scientific description contains two sections:

- A) Scientific Rationale
- B) Immediate Objective

Attachments such as figures are optional and are restricted to the second page of the scientific description, though the respective fractions of that page that are occupied by the scientific description and by the figures are left to the discretion of the proposer.

If the proposal contains runs requesting La Silla telescopes and instruments, the duration of each such run must be at least 3 nights, except for runs using Visitor Instruments or for combinations of contiguous EFOSC2 and SOFI runs (totalling at least 3 nights). In certain cases exceptions may be made for highly ranked La Silla runs that require Designated Visitor Mode observations; see Section 5.1.2 for more details.

Table 1: Available Instruments for Normal Programmes

Telescope	Instrument keywords
UT1	FORS2, KMOS, NACO
UT2	FLAMES, UVES, XSHOOTER
UT3	SPHERE, VIMOS <sup>1</sup> , VISIR
UT4 <sup>2</sup>	HAWKI, MUSE, SINFONI
VLT1	AMBER, GRAVITY, PIONIER
VISTA	VIRCAM
VST	OMEGACAM <sup>3</sup>
NTT	SOFI, EFOSC2, ULTRACAM, SpecialNTT
3.6	HARPS, Special3.6
APEX	ARTEMIS, LABOCA, FLASH <sup>4</sup> ,SEPIA <sup>5</sup> , SHFI, SpecialAPEX

<sup>1</sup> VIMOS is only available in Service Mode for filler programmes requiring bad seeing and/or transparency; VIMOS runs will not be carried over.

<sup>2</sup> Programmes requesting time on UT4 should take into account the provisional timeline and UT4 activities described in Section 1.1.

<sup>3</sup> OMEGACAM is only available for programmes that request poor weather conditions (see Sec. 1.1 for details). However, TOO proposals will also be considered.

<sup>4</sup> FLASH is an APEX PI instrument; in order to propose for its use the instrument PI must be contacted at least two weeks prior to submitting the proposal (see Section 1.1).

<sup>5</sup> Both the band 5 and band 9 receivers are offered.

## 4.2 Monitoring Programmes

Monitoring Programmes (MPs) are only accepted on some instruments (see Table 2). Section 1.1 explains the reasons for these restrictions.

Table 2: Available Instruments for Monitoring Programmes

Telescope	Instrument keywords
UT1	FORS2, KMOS
UT2	FLAMES, UVES, XSHOOTER
UT3	SPHERE
UT4 <sup>1</sup>	HAWK-I, MUSE
VLT1 <sup>2</sup>	GRAVITY, PIONIER
APEX <sup>3</sup>	ARTEMIS, SEPIA <sup>4</sup>

<sup>1</sup> Monitoring Programmes for UT4 instruments must be compatible with constraints imposed by the UT4 activities in Sections 1.1 and 1.3, taking into account that the schedule described is provisional.

<sup>2</sup> Monitoring Programmes on the VLT1 must be compatible with the VLT1 and (if relevant) UT4 activities described in Sections 1.1 and 1.3 taking into account that the schedule described is provisional.

<sup>3</sup> APEX observations for approved MPs can only be carried out in the ESO time-slots.

<sup>4</sup> Both the band 5 and band 9 receivers are offered.

An ESO Monitoring Programme is defined by the criteria listed below.

- A programme requiring less than 100 hours of ESO telescope time. For ESO telescopes, one night in Visitor Mode is defined to be 8 hours in even Periods and 10 hours in odd Periods.



- Both Service Mode and Visitor Mode observations are allowed. For Service Mode runs please note that the time request for each semester should be contained within a single run (per instrument and per constraint type) in order to enable observations within time-linked scheduling containers.
- MP proposals must request a minimum of 2 Periods and can span up to 4 Periods.
- MPs will be judged in the same way as normal programmes but must be amongst the highest ranked programmes in order to be scheduled.
- For APEX instruments, observations for approved MPs can only be carried out in ESO time. Hence, targets can be monitored with a bi-monthly cadence at best.
- ToO programmes cannot be submitted as Monitoring Programmes (Section 4.4).

Monitoring programme proposals should be prepared using the appropriate macro in the L<sup>A</sup>T<sub>E</sub>X template for normal proposals, `template.tex`. See the ESIFORM User Manual for more details.

### 4.3 Large Programmes

Table 3: Available Instruments (Large Programmes)

Telescope	Instrument keywords
UT1	FORS2, KMOS
UT2	FLAMES, UVES, XSHOOTER
UT3	SPHERE
UT4 <sup>1</sup>	HAWK-I, MUSE
VLTI <sup>2</sup>	GRAVITY, PIONIER
VST	OMEGACAM <sup>4</sup>
NTT	SOFI, EFOSC2, SpecialNTT
3.6	HARPS, Special3.6
APEX	ARTEMIS, SEPIA <sup>5</sup>

<sup>1</sup> Large Programmes for UT4 instruments must be compatible with constraints imposed by the UT4 activities described in Sections 1.1 and 1.3, taking into account that the schedule described is provisional.

<sup>2</sup> Large Programmes on the VLTI must be compatible with the VLTI and (if relevant) UT4 activities described in Sections 1.1 and 1.3, taking into account that the schedule described is provisional.

<sup>4</sup> OMEGACAM is only available for programmes that request poor weather conditions (see Sec. 1.1 for details).

<sup>5</sup> Both the band 5 and band 9 receivers are offered.

Large Programmes are only accepted on some instruments in Period 100 (see Table 3). See Section 1.1 for more information on the availability of instruments for Large Programmes in this Period.

Up to a maximum of 30% of the observing time distributed by the OPC on the VLT/VLTI can be allocated to Large Programmes. An ESO Large Programme is defined by the criteria listed below.

- A programme requiring a minimum of 100 hours of ESO telescope time. For ESO telescopes, one night in Visitor Mode is defined to be 8 hours in even Periods and 10 hours in odd Periods.
- A programme that has the potential to lead to a major advance or breakthrough in the field of study, has a strong scientific justification, and a plan for a quick and comprehensive effort of data reduction and analysis by a dedicated team.
- Large Programmes can span from 1 to 4 Periods (*i.e.*, up to a maximum of two consecutive years). GTO programmes that request more than 100 hours are limited to two semesters until their impact has been evaluated.

- A good organisational structure of the proposing team, availability of resources and relevant expertise must be demonstrated.
- ToO programmes cannot be submitted as Large Programmes (Section 4.4).

A special L<sup>A</sup>T<sub>E</sub>X template must be used for Large Programmes (Section 2.2). The proposers may use a total of three pages (not including figures) for the four sections of the scientific description:

- A) Scientific Rationale
- B) Immediate Objective
- C) Telescope Justification
- D) Observing Mode Justification (Visitor or Service)

An additional 2 pages of attachments are permitted. Proposers of Large Programmes should keep in mind that **the entire OPC** (across all scientific categories) as well as the specialised OPC panels will be evaluating their proposal, and that **they should clearly explain the relevance of the proposed programme to general astrophysics**.

If a Large Programme proposal contains runs requesting La Silla telescopes and instruments, the duration of each such run must be at least 3 nights.

Proposers should be aware that the PIs of successful proposals for Large Programmes are required to provide all data products (processed images and spectra, catalogues) to the ESO archive. PIs of Large Programmes are asked to take particular care when completing Sections 6 and 7 in the L<sup>A</sup>T<sub>E</sub>X template form in which they must provide **detailed information on the data quality assessment and data reduction**. They are also required to include the planning for publication of data products (both in terms of content and timeline), which must be finalised within two years of the completion of the data acquisition for the programme. Large Programme proposals must include a precise timeline for the publication of data products in order to comply with ESO's policies.

Guidelines for the submission of these data products, including a description of the required meta-data and formats, can be found on the Phase 3 page; proposers are invited to write an email to [usd-help@eso.org](mailto:usd-help@eso.org) for further information. The Phase 3 page can be found at: <http://www.eso.org/sci/observing/phase3.html>.

During the Period of execution of a Large Programme, and upon its completion, the PI is expected to report regularly to the OPC on the programme's progress. He/she may also be asked to outline the progress and/or outcome of the programme at ESO Large Programme and Survey workshops, similar to those of [October 13-15, 2008](#) or [October 05-09, 2015](#).

#### 4.4 Target of Opportunity

Normally, up to 5% of the available ESO general observing time may be used for **Target of Opportunity** (ToO) proposals. For events with exceptional characteristics ESO will also consider overriding Visitor Mode observations.

ESO recognises two categories of Targets of Opportunity:

1. **Unpredictable ToOs** are those concerning unpredictable astronomical events that require immediate observations. The occurrence of such events cannot be anticipated on a sufficient timeframe to allow them to be the subject of a proposal prepared by the regular proposal submission deadline. They **qualify for allocation of Director's Discretionary Time**. Corresponding applications for observing time should therefore be submitted as DDT proposals (Section 4.7). The 'TOO' type could be selected if executions of observations must be triggered by the PI, as described below.
2. **Predictable ToOs** are those concerning predictable events in a generic sense only. These are typically (but not limited to) known transient phenomena and follow-up or coordinated observations of targets of special interest. Proposals aimed at studying such events are, in the ESO proposal terminology, ToO proposals.

ToO proposals must be submitted using the Normal Programme ESOFORM template. Proposals should be for generic targets and/or times. However, if accepted by the OPC the programme will not be executed until the PI (or his/her delegate) contacts ESO to request its activation after the predicted event has occurred. The observing strategy must be the one approved by the OPC, and the triggers may not exceed the allocated time and number of triggers granted. The observations will be conducted in Service Mode and, in exceptional cases, ongoing programmes may be interrupted. Read more on the [ToO policy](#) page.

As ToO programmes may require a mixture of ToO runs and normal runs proposers are requested to specify the type of runs (TOO or normal) in the tenth (final) field of the `\ObservingRun` macro of the ESOFORM L<sup>A</sup>T<sub>E</sub>X template. A more detailed description of types of ToO runs with accompanying examples can be found in the user manual of the [ESOFORM package](#).

**ToO runs** are defined as runs for which the target and/or observation epoch cannot be known more than one week before the observation needs to be executed. Within this time window, three different types of ToO runs are defined:

- Rapid Response Mode (RRM), for observations to be triggered via the automated Rapid Response Mode system within 4 hours after an event;
- Hard ToO runs, for manually triggered observations that must be carried out as soon as possible or at most within 48 hours of receipt of the trigger by the Observatory, or that involve a strict time constraint (i.e., that must be executed during a specific night);
- Soft ToO runs, for manually triggered observations, for which the Observatory can receive notification more than 48 hours before execution, and which can be scheduled for execution with a flexibility of at least  $\pm 1$  day.

For all ToO runs, generic Observing Blocks (OBs) must be submitted by the PI at Phase 2. Section [4.4.1](#) further describes RRM runs. OBs for Hard and Soft ToO runs will be scheduled for execution following the acceptance by ESO of an activation trigger. This activation trigger must in particular contain the missing information, such as target coordinates, observing time, etc... that the observatory staff need to insert for a successful execution.

Users submitting a ToO programme will need to indicate the number of targets per run and the requested number of triggers per target using the appropriate macros in the L<sup>A</sup>T<sub>E</sub>X template. A trigger is defined as the request for execution of one Observation Block with a given instrument at a given epoch. Similar observations to be executed with the same instrument at different epochs count as different triggers, as do observations with different instruments at the same epoch.

Any observing request by other groups at the time an event occurs (*e.g.*, a DDT proposal), with exactly the same scientific goal and aiming at observing the same object, will be rejected by ESO. ToO runs are **not** carried over to the following Periods.

**It is important to note that:**

- Eventual follow up observations of a ToO target **must** make use of a normal (non-ToO) run, possibly with specific time constraints, if the observations must take place more than one week after reception of the trigger by ESO.
- Targets that are unknown at Phase 1 proposal submission time but can be observed with or without specific (predictable) time constraints more than one week after they have been identified should be observed as part of normal (non-ToO) runs.

In both of these cases, the related OBs should be defined or updated by the PI once the target is known. The OBs should be stored in the ESO database with the complete information needed to allow them to be executed as part of the regular Service Mode queues.

#### 4.4.1 ToO using the Rapid Response Mode (RRM) system

During Period 100, ESO offers the VLT Rapid Response Mode (RRM) system for the following instruments: FORS2 on UT1, UVES and XSHOOTER on UT2, SPHERE on UT3, and HAWK-I,

SINFONI and MUSE on UT4.

RRM proposers should note that:

- A RRM trigger is a special ToO trigger that **can only be activated up to 4 hours after an event**.
- **RRM runs must be exclusively used for triggering the RRM system.** Therefore they must be specified as runs separate from hard or soft ToOs in the ESOFORM template. In particular, this means that:
  - observations to be executed in the same night of an event, but more than 4 hours after it, should be requested through a hard ToO trigger;
  - follow-up observations of a target observed using the RRM system must be requested through the activation of a hard or soft ToO trigger, or a Normal Programme, depending on the classification described above.
- As with ToO programmes, proposers will need to indicate in the L<sup>A</sup>T<sub>E</sub>X template the number of targets per run and the requested number of triggers per target.

Upon receiving an encoded alert indicating the coordinates of the target and the associated Observing Block (OB) to be executed, any ongoing integration will automatically be terminated and the RRM OB will be executed. Depending on the instrument and the target position, the telescope/instrument will be at the location of the target within about 6 minutes following the arrival of the alert at Paranal. Depending on the target brightness and instrument mode target acquisition may take some more time.

RRM observations in Period 100 are subject to the following restrictions:

- The requested instrument must already be in operation. No change of instrument (and telescope focus) is accepted by the automatic RRM system.
- RRM activations will be accepted during Service Mode and Visitor Mode runs. They have overriding priority over other observations, unless the latter are strictly time-critical.

Additionally, the following instrument specific restrictions apply:

- FORS2 can only be used in the broad-band imaging, long slit spectroscopic, imaging polarimetric and spectro-polarimetric modes;
- UVES can only be used with standard wavelength settings;
- during Period 100, the RRM for SPHERE is only offered in ZIMPOL imaging and polarimetry modes, IRDIS classical imaging mode, and IRDIFS in imaging mode;
- SINFONI is available in NGS and noAO mode but not in LGS mode;
- HAWK-I: all the filters can be used, but the trigger requesters must follow the users' manual indications closely as far as brightness restrictions of objects in the field are concerned.

More generally, RRM is only offered for specific instrument modes, as described in the user manuals of the respective instruments. Users interested in using RRM for modes not currently offered for RRM should enquire through [usd-help@eso.org](mailto:usd-help@eso.org) at least two weeks before the proposal submission deadline.

The delivery of the encoded alerts to the Paranal Observatory is entirely the responsibility of the PI. Successful PIs will be asked to provide a set of OBs by the Phase 2 deadline, to be certified for execution as is done for other Service Mode runs. Details on the activation mechanisms and the preparation of RRM observations can be found at the Phase 2 [RRM Observation page](#).

## 4.5 Guaranteed Time Observations

**Guaranteed Time Observations** (GTO) arise from contractual obligations of ESO vis-à-vis the external consortia who build ESO instruments (see the [GTO Policy page](#)).

In Period 100, GTO teams can request time up to two Periods, if compatible with the corresponding GTO contract. These are called Large GTO programmes and are being offered on a trial basis; proposals for a Large GTO should be prepared using the ESIFORM Large Programme template, keeping the programme type as Large and entering the GTO contract keyword where specified. PIs should also note that any GTO proposal requesting time through the Large Programme channel is subject to the same requirements to provide a detailed delivery plan for data products and other conditions governing the reporting on the progress of Large Programmes.

If the GTO programme time request is for under 100 hours and only requires time in Period 100, the GTO team should fill in a Normal Programme template form specifying the GTO Programme Type and the appropriate GTO contract keyword.

All GTO proposals will be evaluated and ranked together with Normal and Large Programme proposals in order to provide feedback to the GTO teams on the scientific standing of their GTO programmes. In exceptional cases, badly ranked GTO proposals may not be scheduled. The policies describing the obligations of Guaranteed Time Observers are defined in Appendix 2 of the [ESO Council document ESO/Cou-996](#). VLT GTO policies were updated in December 2015 and are described in detail in [ESO Council document ESO/Cou-1628](#).

GTO runs must be conducted in Visitor Mode (Section 5.1). The only exceptions are those explicitly stated in the contractual agreement between ESO and the corresponding external consortium. However ESO may exceptionally transfer some GTO runs from Visitor Mode to Service Mode for operational reasons (such as the availability of certain VLTI baselines or instruments).

Some GTO programmes require ToO runs<sup>1</sup> (see Section 4.4). If this is the case then this should be specified in the ESIFORM package using the `\ObservingRun` macro of the L<sup>A</sup>T<sub>E</sub>X template.

## 4.6 Proposals for Calibration Programmes

ESO operates a large number of complex instruments with many possible configurations and observing modes. Although the Observatory executes a rigorous calibration plan for each instrument, ESO does not have the resources to fully calibrate all potential capabilities of all instruments. On the other hand, the astronomical community has expressed interest to perform calibrations for certain uncalibrated or poorly calibrated modes, or to develop specialized software for certain calibration and data reduction tasks. **Calibration Programmes** allow users to complement the existing calibration of ESO instruments and to fill any existing gaps in the calibration coverage. Regular workshops are also held to bring together instrument scientists and astronomers in order to discuss their experiences and identify challenges in order to continuously improve calibration of ESO's instruments. The latest such workshop was held in Santiago, Chile from January 16-19, 2017; further details are available from the [2017 ESO Calibration workshop webpage](#).

Up to 3% of all the available observing time may be made available for Calibration Programmes. Calibration Programme proposals will be evaluated by the OPC with a view to balancing the added calibration value for future science with the more immediate return of the regular science proposals of the current Period. Calibration Programmes are reviewed by ESO with regards to their technical and operational feasibility.

Successful proposers will be required to deliver documentation, data products and software to ESO to support future observing programmes. The procedure to be followed is described at <http://www.eso.org/sci/observing/phase3.html>. The raw calibration data, as well as the advanced calibration products that are obtained as part of Calibration Programmes are non-proprietary and made available to the entire community through the ESO archive, and the respective instrument Web pages. Scientific publications that make use of the data or results of Calibration Programmes will have to reference the corresponding proposals.

<sup>1</sup>The possibility for GTO teams to request ToO observations as part of their guaranteed time is restricted to those cases in which this option is explicitly mentioned in the GTO contract.

Calibration Programme proposals must be submitted using the ESOFORM template for Normal Programmes. In Box 7A (entitled “*Scientific rationale*”) the proposers should clearly state the limits of the existing calibration plan and the expected improvement that can result from the proposed observations. Moreover the proposal should emphasise the relevance and the overall scientific gain of the calibration techniques and products resulting from these observations. Calibration Programmes do not pertain to any of the standard OPC categories (A, B, C or D), since in general they are not directly related to a unique scientific area: the special subcategory code L0 should be used to distinguish them. The PIs of Calibration Programmes are required to deliver to ESO the resulting Advanced Data Products within one year of the completion of the corresponding observations.

## 4.7 Director’s Discretionary Time

Up to 5% of the general available observing time may be used for **Director’s Discretionary Time** (DDT) proposals in the current Period. These programmes are generally of short duration (< 5 hours), though a longer time request may be granted if justified by a strong science case. Only DDT proposals belonging to one of the following categories will be considered:

- proposals of ToO nature requiring the immediate observation of a sudden and *unexpected* astronomical event;
- proposals requesting observations on a highly competitive scientific topic;
- proposals asking for follow-up observations of a programme recently conducted from ground-based and/or space facilities, where a quick implementation should provide break-through results;
- proposals of a somewhat risky nature requesting a small amount of observing time to test the feasibility of a programme.

DDT programmes that have target of opportunity runs should mark their corresponding Run Types as “TOO” in the `\ObservingRun` macro. See the ESOFORM User Manual for more details. DDT programmes involving TOO runs should also fill in the `\TOORun` macros in the ESOFORM proposal template as instructed.

Approved DDT proposals are carried out in Service Mode on Paranal and Chajnantor, or in Visitor Mode override on La Silla. Very few non-time-critical DDT proposals are foreseen to be approved so proposers should provide a clear justification (in Box 8b of the application form) why the programme should be considered for DDT allocation and why it was not submitted through the regular OPC channel. In the absence of such a justification, the proposal will not be considered for DDT allocation, and the proposers will be encouraged to resubmit their proposals for the next appropriate OPC submission deadline. *As a general rule, proposals originally submitted to the OPC that were not allocated time should not be submitted as DDT proposals.*

DDT proposals may be submitted at any time. They must be prepared using the special ESOFORM DDT template. Proposers must upload the DDT ESOFORM template and submit their DDT proposals by registering and logging into the ESO User Portal. You can find more details at:

<http://www.eso.org/sci/observing/phase1/esoform.html>

DDT proposals are reviewed by a DDT committee, which issues recommendations for approval by the Director General. Urgent requests must be clearly identified in Box 5 (Special Remarks) of the application form.

## 4.8 Host State Proposals

Qualifying proposals whose PI is affiliated with an institute of the Host State (Chile) are counted as *Host State Proposals*. The designation as *Host State Proposal* is independent of the fraction of non-member state. Chile’s participation is regulated by the “Interpretative, Supplementary and Amending Agreement” to the 1963 Convention (Sect. 6.1).

## 4.9 Non-Member State Proposals

A **Non-Member State Proposal** is a proposal where 2/3 or more of the proposers are not affiliated to ESO member state institutes, independently of the nationality of the proposers and of the affiliation of the PI. Non-member state proposals are submitted in the usual way, but a separate set of criteria are used for the review of such proposals (Section 6.1).

## 5 Observing Modes

In Period 100, most VLT and VLTI instruments will be offered in two modes: *Visitor Mode* (VM) and *Service Mode* (SM). These modes have been extensively described in the Data Flow Operations section of the [December 1997](#) and [June 1998](#) issues of The ESO Messenger. Further information can be found in the articles on Service Mode scheduling in the [September 2001](#) issue and the article, “*Fifteen Years of Service Mode Operations*” in the [December 2014](#) issue. As part of the Phase 1 proposal, investigators are requested to specify which mode they desire. While every effort will be made to follow the proposed observing mode, ESO does reserve the right to allocate time in a mode that is different from the one requested. Note especially the restrictions of available modes detailed in Sects. 5.1 and 5.2 (including Designated Visitor Mode), as well as the policy in Section 6.3.

The telescope, as well as the instruments, will be operated by observatory staff only. The astronomer interfaces with the telescope/instruments via Observation Blocks (OBs), produced using the Phase 2 Proposal Preparation (P2PP) tool. Observers use the latest [P2PP 2.13](#) version for La Silla observations and [P2PP v3](#) for Paranal observations. A new web-based P2PP will be made available for the preparation of Paranal Visitor Mode and Designated Visitor Mode observations. This tool will also be extended to Service Mode in the future.

### 5.1 Visitor Mode

In **Visitor Mode** (VM) the astronomer is physically present at the observatory during the observations. Each approved VM run will be allocated specific calendar nights. One of the programme investigators will travel to the Observatory and execute the observations. Visitor Mode is not offered on VST, VISTA or APEX.

Data acquisition for all ESO instruments will be done by executing Observation Blocks (OBs), *i.e.*, observing sequences specified by the astronomer that are based on templates provided by ESO. VM investigators will be encouraged to construct their OBs before arriving on the site using P2PP. At the telescope OBs can be created or further modified in real-time (with the exception of VIMOS MOS and FORS2 MXU mode). VM investigators will be required to arrive on Paranal before the start of their observing run as follows: 24 hours for UVES, and 48 hours for all other instruments. On La Silla, visiting astronomers shall arrive 1 to 2 days before the start of the observations, and may leave the site up to 1 to 2 days after the end of their observing run according to the transportation schedule (see the [La Silla Science Operations page](#)). Observers should note that twilight during Visitor Mode runs is used by the observatory to acquire calibrations and will be given to observers on a best-effort basis.

Note that programmes must be executed as specified and approved at Phase 1. The proposer should prepare a backup/alternative programme to be executed in place of the primary programme if the observing conditions are not ideal. The original science case and goals should be followed. Such backup programmes must be approved by ESO at least two weeks in advance of the observing run. Requests sent on shorter notice, in particular within less than 48 hours from the start of the run, may not be processed on time. In those cases, the corresponding data will not be accessible from the ESO Science Archive Facility until the request is approved. The corresponding requests must be submitted via the web-based form available at the Target/Instrument Setup [Change Request](#) webpage. If the conditions prevent the Visiting Astronomer’s primary programme to be executed the telescope will be used for the execution of Service Mode observations, assuming no backup programme is in place and that Service Mode observations are allowed on that telescope. Raw data

are available for download shortly after acquisition.

Please note that **VM proposers must include overheads** for all science exposures. Guidelines are provided in the [Overheads page](#).

Though it is very rare, the Observatory may interrupt Visitor Mode observation to allow Service Mode observations. In general, the Observatory does not compensate for weather or technical losses of observing time. However, compensation may be granted by the Director of the Observatory under exceptional circumstances.

### 5.1.1 ToO programme execution during VM observations

VM observations may be interrupted by time-critical DDT or ToO programmes. As far as possible, the execution of observations for such programmes will be confined to scheduled Service Mode Periods. Under exceptional circumstances, the Director of the Observatory may decide to interrupt VM runs to allow ToO observations. ToO runs in the Rapid Response Mode (RRM) may also interrupt VM observations (see Section 4.4.1).

### 5.1.2 Designated Visitor Mode

ESO reserves the right to allocate telescope time in Designated Visitor Mode (DVM) instead of regular VM for any runs with a duration smaller than one night and a justified need for VM. The final decision will be based on the technical feasibility reports and the Principal Investigators will be informed of their DVM time allocation via the web letters.

Designated VM observations on Paranal are scheduled on specific dates/slots as if they were regular Visitor Mode runs, but they are executed by an ESO staff member, in close contact (e.g. via phone, Skype or video link) with the Principal Investigator, or someone the PI designates to serve as the liaison with the Observatory. More details, including all requirements concerning the preparation of DVM runs are provided on the [Paranal Sciences Operations webpage](#). As for normal Visitor Mode runs, the users can request additional science targets, instrument setup changes and backup targets. However, such requests must be submitted at least 4 days in advance of the run, in line with the submission of the overall material to the Observatory. Otherwise, such requests will not be processed.

Due to the reduced operations at La Silla Designated Visitor Mode is being offered on a best-effort basis, with the following restrictions: in general, only one DVM programme per night can be executed so only the highest ranked runs are likely to be supported; OBs must be rounded up to the nearest tenth of a night (e.g., 0.1n rather than 0.07n) whenever possible; OBs scheduled in DVM must be submitted to [lasilla@eso.org](mailto:lasilla@eso.org) by the Phase 2 deadline; observations will be executed by a telescope operator; contact with the PI is therefore very limited. Please contact [opo@eso.org](mailto:opo@eso.org) well before the proposal submission deadline if you would like your programme to be considered for DVM at La Silla.

## 5.2 Service Mode

Over half of the total time available for observations on Paranal will be carried out in Service Mode (SM). SM is also the only mode supported for APEX, VST and VISTA. It is not offered on any La Silla telescope.

Investigators with runs allocated in SM will be required to specify their programme by submitting a Phase 2 package in advance to ESO. This package consists of OBs, finding charts, a Readme form and, if applicable, ephemerides. Observers intending to submit proposals to be executed in SM may find it useful to familiarize themselves with the Phase 2 Service Mode [guidelines](#). Once the OBs are completed, they will be submitted to ESO for verification and acceptance.

Accepted OBs will be executed by ESO staff based on their OPC-recommended priority and a proper match between the requested and the actual observing conditions. An article about SM scheduling appeared in [The ESO Messenger \(2001, v. 105, p. 18\)](#). The article helps proposers



understand how they may optimize their use of this observing mode, and it should be considered compulsory reading for SM proposers. SM PIs and their data delegates have direct access (via their personal ESO User Portal account) to their own raw proprietary data as soon as the data is ingested in the ESO Archive. Note that in Service Mode the proprietary period for a given science file starts as soon as the data are made electronically available to PIs or to those to whom they have delegated their data access rights.

Please note that **SM proposers must include overheads** for all science exposures. Guidelines are provided in the [Overheads page](#).

ESO will absorb all the time required to complete the calibration sequences to the level of accuracy foreseen in the calibration plan as well as overheads associated with such calibrations. More information on the Paranal Calibration plans can be found from the VLT/VLTI [Instrument Pipelines](#) webpage and the respective instrument User Manual. If those calibrations are not adequate, the SM proposer must include time for any additional calibrations including overheads.

Proposers are especially encouraged to request Service Mode (on Paranal) if their programme involves Target of Opportunity events or synoptic observing, or if they require the best observing conditions (which occur at unpredictable intervals). Further information on SM observing may be found in the [Service Mode Guidelines](#).

### 5.2.1 Service Mode policies

To ensure the efficiency of Service Mode (SM) observing, ESO has implemented a number of rules for, procedures and limitations on SM runs. They need to be carefully considered at the time of preparing an application for SM observations and are summarized here. Please note that these items have important consequences on the way that execution overheads must be taken into account. Please consult the Phase 2 webpages for the latest information on [SM policies](#) and [SM OB rules](#). Proposers should note that Phase 1 constraints are [binding](#) (see Section 6.5).

- **Some observing strategies cannot be supported in Service Mode;** in particular, real-time decisions about complex OB sequencing, or decisions based on the outcome of previously executed OBs (like adjustment of integration times or execution of some OBs instead of others).
- **Observation Blocks (OBs) execution.** OBs are usually executed non-contiguously, it is thus not possible to reduce acquisition overheads by requiring the sequential execution of OBs with the same target field. Since efficient SM operations require continuous flexibility to best match the OB constraints with actual observing conditions, OBs for a given run are normally scheduled non-contiguously. Exceptions to this are made for OBs within concatenation scheduling containers; also see the [Programmes with linked time requirements](#) item below.
- **Multi-mode, multi-configuration OBs are normally not permitted in SM.** Although multiple configurations within one OB may sometimes reduce overheads, scheduling and calibrating such OBs is extremely inefficient and can increase the calibration load to an unsustainable level. Examples of such multi-configuration OBs are those combining imaging and spectroscopy in a single OB, spectroscopy with multiple grisms or central wavelength settings, or imaging with a large number of filters (although most imagers allow multiple broadband filters in one OB). Multi-configuration OBs are accepted only if duly justified and authorized by means of a [Phase 2 Waiver Request](#).
- **OB Total Execution Time.** Proposers should make sure that all overheads, including telescope presetting and acquisition [overheads](#) have been properly included. A detailed overheads computation can be obtained by running the [Phase 2 Preparation Tool \(P2PP\)](#) in tutorial mode.
- **OB execution times must be below 1 hour.** This rule also applies to concatenated OBs in most cases. Long OBs and concatenated OBs are more difficult to schedule and execute within the specified constraints because of the unpredictable evolution of the observing conditions. OBs taking more than one hour to execute are not normally accepted. Proposers are especially encouraged to plan for OBs substantially shorter than one hour if the execution conditions

are particularly demanding, as the fulfillment of all the constraints during the entire execution time becomes more unlikely as the OB becomes longer. Please see the “[Service Mode OBs](#)” item in Section 1.2 for more information.

- **Fulfillment of Phase 2 constraints:** ESO will consider an OB as successfully executed if all the conditions in the constraint set are fulfilled. OBs executed under conditions marginally outside constraints by no more than 10% of the specified value will not be scheduled for re-execution. Please note that OBs executed marginally outside specified LST constraints by no more than 20 minutes will not be scheduled for re-execution. AO-assisted observations with NACO or SINFONI within 50% of the requested Strehl ratio will not be repeated (assuming that other constraints are suitably met).

VLTI OBs executed marginally outside the specified LST intervals by no more than 30 min will not be scheduled for re-execution.

- **Programmes with linked time requirements:** SM is also intended to support programmes with special timing requirements. However, proposers planning such programmes should keep in mind that at most 60% of both bright and dark time is allocated to SM (on Paranal), and that observing conditions cannot be predicted when a time-series is started. This means that timing sequences that are extremely long and/or complex, timing links that are very restrictive, and time-series for observations requiring excellent observing conditions, are unlikely to be successfully completed. Therefore, all such proposals are reviewed for technical feasibility and may be rejected if judged to be too complex. Proposers for programmes requiring timing links are strongly encouraged to consider how they may simplify their timing sequences as much as possible, as this will minimize the risk that the observations are deemed unfeasible. They should also read the [Time critical OB execution policy page](#).

If a given OB cannot be executed within its intended observability window, it will be removed from the observing queue and will not be attempted again. If it was part of a time-linked series, then the time-series observation will continue with the next OB if appropriate. ESO will not restart a sequence of linked observations if the pre-specified timing constraints cannot be fulfilled. More details on how version 3 of the Phase 2 Proposal Preparation (P2PP) tool can be used to time-link, group or concatenate various OBs, are described in <http://www.eso.org/sci/observing/phase2/P2PP3.html>.

- **ToO programme execution** Successful proposers of ToO runs will have to prepare OBs for their observations well ahead of the beginning of an observing Period (see Section 5.2). Mostly ToO OBs will have to be “dummy” OBs with default values for target coordinates, integration times etc. At the time of occurrence of the predicted event, the PI of the programme (or one of his/her delegates) must activate it and at the same time provide the missing information for completion of the OBs. The service observer will update and execute the specified OBs. Further details are available on the Phase 2 [ToO Procedures page](#).

## 6 Policy Summary

Several policies regarding all aspects of the use of ESO telescopes have been refined over the years by the ESO Council, as advised by the Observing Programmes Committee (OPC), and by the Science and Technology Committee (STC). Here we summarize those policies relevant for ESO proposers for Period 100. For details on individual policies we refer to the [VLT/VLTI Science Operations Policy](#) document.

### 6.1 Who may submit, time allocation policies

ESO proposals may be submitted by any group or individual. One single person, the **Principal Investigator** or PI, must be assigned to be responsible for the programme. The PI will also act as the official contact between ESO and the proposers for all later correspondence (Phase 2 information, data distribution, etc.). By submitting a proposal, the PI takes full responsibility for its contents, in particular with regard to the names of CoIs and the agreement to follow the ESO policies and

regulations, including the conditions specified in the present Call for Proposals. Following the introduction of the ESO User Portal, PIs identify themselves uniquely in Phase 1 proposals by their User Portal username. Note that each individual is allowed to have only one account in the User Portal database; multiple accounts must not be created. Failure to comply with this restriction may lead to the rejection by ESO of the corresponding proposals.

All valid proposals received by ESO prior to the submission deadline will be reviewed by the OPC, who will rank them according to the scientific merit and the importance of its contribution to the advancement of scientific knowledge. Furthermore, proposals should provide evidence that the proposing individual or team have the expertise and sufficient resources to carry out the analysis.

Proposals should be self-contained. The evaluation will be based solely on their contents.

For non-member state proposals (Section 4.9) the additional criteria listed below will be taken into account.

- The required telescope/instrumentation is not available at any other observatory accessible to the applicants.
- If an ESO member state proposal and a non-member state proposal are rated equally, preference will be given to the ESO member state proposal.

The following policy, extracted from the agreement between ESO and its host state Chile, governs the allocation of time to **Host State Proposals** (Section 4.8): “Chilean scientists who present meritorious projects shall have the right to obtain up to 10% of the observing time of ESO telescopes”. For VLT projects at least one half of this 10% shall be dedicated to projects of Chilean astronomers in cooperation with astronomers of ESO member countries.

Following the recommendations of the OPC and a technical feasibility check, the ESO Director General grants observing time based on the OPC ranking and the availability of telescope time.

## 6.2 Requesting use of non-standard observing configurations

Proposers should pay particular attention to the fact that, as indicated in the instrument manuals, use of certain non-standard instrumental modes or configurations requires prior approval by ESO. This approval must be obtained before submitting the Phase 1 proposal. Corresponding requests, including a brief justification, must be submitted by email to [usd-help@eso.org](mailto:usd-help@eso.org) at least two weeks before the proposal submission deadline. Failure to follow this rule may lead to the rejection of the proposal by ESO for technical reasons.

Users who wish to request a new (own) filter to be installed, particularly in the cryogenic instruments (e.g., HAWK-I, VIRCAM, VISIR) must approach ESO via [usd-help@eso.org](mailto:usd-help@eso.org) at least 3 months before submitting a proposal requesting that filter. Failure to follow these guidelines may lead to the rejection of the proposal by ESO for technical reasons.

## 6.3 Policy regarding offered/available observing configurations

Users will be promptly informed if it becomes impossible to support some currently offered instrument mode, and may be asked to switch from Service Mode to Visitor Mode or vice versa. In general, runs requiring non-standard configurations will only be accepted in Visitor Mode.

## 6.4 Observing programme execution

Observations in both Visitor and Service Mode must be executed as described in the Phase 1 proposal, including the instrument modes and specified targets. Departures from Phase 1 specifications and targets will not generally be allowed, unless a sound scientific justification exists, and provided that the change does not involve a significant increase in the pressure factor on oversubscribed regions of the sky. The request for changes of targets and instrument setup(s), along with

the corresponding scientific justification, must be submitted via the web-based form available at <http://www.eso.org/sci/observing/phase2/ProgChange/>.

For any other departure from Phase 1 specifications a justification must be provided in writing to [paranal@eso.org](mailto:paranal@eso.org) at least one month before the beginning of the observations for runs scheduled in Visitor Mode. For Service Mode runs, these requests and associated justifications must be submitted to [usd-help@eso.org](mailto:usd-help@eso.org) or to [p2pp-waiver@eso.org](mailto:p2pp-waiver@eso.org) (clear instructions are available at <http://www.eso.org/sci/observing/phase2/SMGuidelines/WaiverChanges.html>) at least one week before the Phase 2 deadline (also see Section 6.5).

ESO reserves the right to reject the changes if they are insufficiently justified, conflicting with any other approved programmes, or imply significant changes in the overall distribution of scheduled targets in the sky. Observations of targets for which no authorization has been obtained are not allowed at the telescope.

#### 6.4.1 Service Mode run execution

The runs to be conducted in Service Mode will be subdivided into the following classes for operational reasons:

- **Class A:** All possible efforts will be made to execute all OBs corresponding to the runs in the requested observing Period. Approximately the first half (according to the OPC ranking) of the total amount of Service Mode time scheduled on each telescope falls in this class.
- **Class B:** These runs will be executed in the requested observing Period on a best-effort basis. Approximately the second half (according to the OPC ranking) of the total amount of Service Mode time scheduled on each telescope falls in this class.
- **Class C:** Filler runs. OBs will only be executed if the observing conditions do not permit observations for runs within classes A and B. The “any weather” proposals mentioned in Section 1.1 would fall under this category.

For Class A runs that are not completed by the end of Period 100, ESO will decide whether they can be declared “substantially complete”, or have to be carried over to the next Period provided that this is technically feasible. In general, a Class A run will not be carried over for more than one additional natural visibility Period. Class B and C runs will not be carried over. Monitoring Programme and ToO runs are by definition Class A regarding priority in execution but they will not be carried over to the following Periods regardless of their completion status. As Monitoring Programmes span multiple Periods for the purposes of monitoring individual targets/fields this removes the necessity for the creation of carryover runs.

Proposers are particularly encouraged to consider their observing strategy and how they can simplify any time constraints are much as possible to increase chances of being scheduled. Guidelines on the handling of time-critical OBs are available at the [Time critical OB execution policy page](#).

### 6.5 Phase 2 Service Mode policy: constraints and targets are binding

In order to optimize the use of ESO telescopes in Service Mode for a given Period, it is necessary to maintain a proper mix of runs requiring a variety of observing conditions, and with targets spread over the entire range of RAs. For this reason, proposers are requested in their Phase 1 proposal to specify not only the targets with accurate coordinates, but also the required observing conditions (lunar phase, seeing, sky transparency). **Due to their essential role in determining the long-term scheduling of Service Mode time, the constraints specified at Phase 1 are binding.** Successful proposers will not be allowed to change the instrument setups, target lists and/or times per target that were requested at Phase 1 in their Phase 2 submissions, unless explicitly authorized by ESO (see Section 6.4). The relaxation of observing constraints is allowed at Phase 2 only. See Section 6.4 for more details on how to request waivers for Service Mode runs.

## 6.6 Pre-imaging runs

A separate run must be specified for a VLT programme requiring pre-imaging. If this is not specified in the proposal, the time needed for the execution of the pre-imaging will be deducted from the total allocation of the project. Pre-imaging runs are always scheduled in priority class A, but must be specified as pre-imaging runs as this will not occur automatically. Please be sure to indicate the pre-imaging character of the run by using the corresponding `\INSconfig` macro in the L<sup>A</sup>T<sub>E</sub>X ESOFORM template. Note that pre-imaging OBs are not allowed to be in concatenation containers. The execution time for the pre-imaging run has to be calculated for single OBs.

## 6.7 Data rights, archiving, data distribution

All data obtained with ESO facilities are ESO property. ESO grants a 12-month proprietary period for science and acquisition data to the PI of the programme. This period applies to each data file individually. The proprietary period starts as soon as the data is made available to the PI or respective delegates via the [ESO Science Archive Facility](#), *i.e.*, as soon as the data are ingested. Should you wish to specify a shorter period than the nominal 12 months in Period 100, please do so using the `\ProprietaryTime` macro in the L<sup>A</sup>T<sub>E</sub>X ESOFORM template. Raw data of Public Surveys and calibration data are not subject to a proprietary period and become publicly available as soon as they are ingested in the ESO Archive.

For both Visitor Mode and Service Mode observations, the ESO Science Archive Facility (<http://archive.eso.org>) is the sole access point to data obtained with ESO telescopes. PIs of Service and Visitor Mode programmes and their data delegates have access to their proprietary raw data as soon as the data have been ingested in the ESO Archive, which typically happens a few hours after the observation. Access to the data is provided through the ESO User Portal credentials. The [CalSelector](#) archive service for VLT instruments combines the science files with any ancillary files that are needed to process the data, (e.g. acquisition images, calibrations, etc.).

## 6.8 Publication of ESO telescope results

Publications based on observations collected at ESO telescopes must state this in a footnote to the article’s title or in the acknowledgments, as outlined on the [ESO publications policy](#) page. The observing run ID(s) must be clearly identified by their ESO reference number(s) as shown in the following example:

*“Based on observations collected at the European Organisation for Astronomical Research in the Southern Hemisphere under ESO programme 0100.C-1234(A).”*

## 6.9 Press Releases

Should you consider that your results are worthy of a press release to the general public, please contact the ESO Outreach Department ([information@eso.org](mailto:information@eso.org)) as soon as possible, preferably no later than when the paper is submitted for publication. ESO reserves the right to use any data obtained with ESO telescopes as part of programmes allocated ESO time for press releases.

## Part III

## Appendix

## A Acronyms

4QPM	Four Quadrant Phase Mask
AGPM	Annular Groove Phase Mask
AMBER	Astronomical Multi-BEam combineR
APEX	Atacama Pathfinder EXperiment
ARTEMIS	Architectures de bolomètres pour des Télescopes à grand champ de vue dans le domaine sub-Millimétrique au Sol
AT	Auxiliary Telescope for the VLT Interferometer
CHAMP+	Carbon Heterodyne Array of the MPIfR
CI	Classical Imaging
CIAO	GRAVITY Coudé Infrared Adaptive Optics (CIAO) system for the VLT Interferometer
CoI	Co-Investigator
CONICA	High-Resolution Near Infrared CAmera
CPI	Common Path and Infrastructure
CRIRES	Cryogenic high-resolution IR Échelle Spectrometer
DBI	Dual-Band Imaging
DDT	Director's Discretionary Time (proposal)
DPI	Dual-Polarization Imaging, Differential Polarimetric Imaging
EFOSC2	ESO Faint Object Spectrograph and Camera 2
ESO	European Southern Observatory
ESPRESSO	Échelle SPectrograph for Rocky Exoplanet and Stable Spectroscopic Observations
ETC	Exposure Time Calculator
FLASH	First-Light Apex Sub-millimeter Heterodyne
FLAMES	Fibre Large Array Multi Element Spectrograph
FLASH	First-Light Apex Sub-millimeter Heterodyne
FORS2	Focal Reducer/low dispersion Spectrograph 2
GLAO	Ground Layer Adaptive Optics
GRAVITY	Second generation VLTI instrument in the K band
GTO	Guaranteed Time Observations
HARPS	High Accuracy Radial velocity Planet Searcher
HAWK-I	High Acuity Wide field K-band Imager
IFS	Integral Field Spectrograph
IR	Infra-Red
IRDIS	Infra-Red Dual-Band Imager and Spectrograph
ISAAC	Infrared Spectrometer And Array Camera
KMOS	K-band Multi-Object Spectrograph
LABOCA	LArge BOlometer CAmera
LGS	Laser Guide Star
LRS	Low-Resolution Spectroscopy
LSS	Long Slit Spectroscopy
LST	Local Sidereal Time
MACAO	Multi-Applications Curvature Adaptive optics
MATISSE	Multi AperTure mid-Infrared SpectroScopic Experiment
MOS	Multi-Object Spectroscopy
MPIfR	Max Planck Institut für Radioastronomie
MRS	Medium-Resolution Spectroscopy
MUSE	Multi-Unit Spectroscopic Explorer
NACO	NAOS-CONICA
NAOMI	New Adaptive Optics Module for Interferometry
NAOS	Nasmyth Adaptive Optics System
NGS	Natural Guide Star

OB	Observation Block
OMEGACAM	Wide Field Imager for the VST at Paranal
OPC	Observing Programmes Committee
OPO	Observing Programmes Office
P2PP	Phase 2 Proposal Preparation (software tool)
PI	Principal Investigator
PIONIER	Precision Integrated-Optics Near-infrared Imaging Experiment
PWV	Precipitable Water Vapour
RA	Right Ascension
RRM	Rapid Response Mode
SABOCA	Submillimetre APEX BOlometer CAmera
SAM	Sample Aperture Mask
SEPIA	Swedish-ESO PI receiver for APEX
SHFI	Swedish Heterodyne Facility Instrument
SINFONI	Spectrograph for INtegral Field Observations in the Near Infrared
SM	Service Mode
SPHERE	Spectro-Polarimetric High-contrast Exoplanet REsearch
SPIFFI	SPectrometer for Infrared Faint Field Imaging
STS	Star Separator System
ToO	Target of Opportunity
ULTRACAM	High speed camera
USD	User Support Department
UT1	Unit Telescope 1 (Antu)
UT2	Unit Telescope 2 (Kueyen)
UT3	Unit Telescope 3 (Melipal)
UT4	Unit Telescope 4 (Yepun)
UV	Ultra Violet
UVES	UV-Visual Échelle Spectrograph
VIMOS	VIisible MultiObject Spectrograph
VIRCAM	VISTA InfraRed CAmera
VISIR	VLT Imager and Spectrometer for mid Infra Red
VISTA	Visible and Infrared Survey Telescope for Astronomy
VLT	Very Large Telescope
VLTI	Very Large Telescope Interferometer
VM	Visitor Mode
VST	VLT Survey Telescope
XFFTS	eXpanded Fast Fourier Transform Spectrometer
XSHOOTER	UV-Visual-NIR medium resolution échelle spectrograph
ZEUS-2	Redshift (z) and Early Universe Spectrometer
ZIMPOL	Zurich IMaging POLarimeter

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