



# **ESO Call for Proposals – P109**

**Proposal Deadline: 23 September 2021, 12:00 noon CEST**



# **Call for Proposals**

## **ESO Period 109**

**Proposal Deadline: 23 September 2021,  
12:00 noon Central European Summer Time**

**Issued 26 August 2021**

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 submit your enquiries through the [ESO Helpdesk](#).

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:* Dimitri A. Gadotti

Approved: -----

Xavier Barcons  
*Director General*

# Contents

<b>I</b>	<b>Phase 1 Instructions</b>	<b>1</b>
<b>1</b>	<b>ESO Proposals Invited</b>	<b>1</b>
1.1	Important recent changes (since Periods 107 and 108)	2
1.1.1	General	2
1.1.2	Paranal	3
1.1.3	La Silla	5
1.1.4	Chajnantor	5
1.2	Important reminders	6
1.2.1	General	6
1.2.2	Paranal	7
1.2.3	La Silla	9
1.2.4	Chajnantor	9
1.3	Changes foreseen in the upcoming Periods	10
<b>2</b>	<b>Getting Started</b>	<b>10</b>
2.1	Support for VLTI programmes	11
2.2	Exposure Time Calculators	11
2.3	The p1 proposal submission tool	11
2.3.1	Important notes	12
2.4	Proposal Submission	13
<b>3</b>	<b>Visitor Instruments</b>	<b>13</b>
<b>II</b>	<b>Proposal Types, Policies, and Procedures</b>	<b>14</b>
<b>4</b>	<b>Proposal Types</b>	<b>14</b>
4.1	Normal Programmes	14
4.2	Monitoring Programmes	15
4.3	Restrictions to Monitoring Programmes	15
4.4	Guaranteed Time Observations	16
4.5	Proposals for Calibration Programmes	16
4.6	Director's Discretionary Time	17
4.7	Target of Opportunity	18
4.7.1	ToO runs	18
4.7.2	ToO using the Rapid Response Mode (RRM) system	19
4.8	Host State Proposals	21
4.9	Non-Member State Proposals	21
4.10	VLT-XMM proposals	21
<b>5</b>	<b>Observing Modes</b>	<b>22</b>
5.1	Visitor Mode	22
5.1.1	ToO programme execution during VM observations	23
5.1.2	Designated Visitor Mode	23
5.2	Service Mode	23
5.2.1	Service Mode policies	24
<b>6</b>	<b>Policy Summary</b>	<b>25</b>
6.1	Who may submit, time allocation policies	25
6.2	Requesting use of non-standard observing configurations	26
6.3	Policy regarding offered/available observing configurations	26
6.4	Observing programme execution	26
6.4.1	Service Mode run execution	27
6.5	Phase 2 Service Mode policy: constraints and targets are binding	27
6.6	Pre-imaging runs	28

6.7	Data rights, archiving, data distribution . . . . .	28
6.8	Publication of ESO telescope results . . . . .	28
6.9	Press Releases and other communication products . . . . .	28
<b>III</b>	<b>Appendix</b>	<b>29</b>
<b>A</b>	<b>Acronyms</b>	<b>29</b>

## Part I

# Phase 1 Instructions

## 1 ESO Proposals Invited

The **European Southern Observatory (ESO)** invites proposals for observations at ESO telescopes during Period 109 (1 April 2022 – 30 September 2022). The following instruments are offered in this Period:

### La Silla

---

[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

---

[CRIRES](#) (Cryogenic high-resolution IR Échelle Spectrograph)  
[ESPRESSO](#) (Échelle SPectrograph for Rocky Exoplanets and Stable Spectroscopic Observations)  
[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)  
[HAWK-I](#) (High Acuity Wide field K-band Imager)  
[KMOS](#) (K-band Multi-Object Spectrograph)  
[MATISSE](#) (Multi-AperTure mid-Infrared SpectroScopic Experiment)  
[MUSE](#) (Multi Unit Spectroscopic Explorer)  
[PIONIER](#) (Precision Integrated-Optics Near-infrared Imaging ExpeRiment)  
[SPHERE](#) (Spectro-Polarimetric High-contrast Exoplanet REsearch)  
[UVES](#) (UV–Visual Échelle Spectrograph)  
[VIRCAM](#) (VISTA InfraRed CAMera)  
[VISIR](#) (VLT Imager and Spectrometer for mid-InfraRed)  
[X-SHOOTER](#) (UV–Visual–NIR medium resolution échelle spectrograph)

### Chajnantor

---

[ARTEMIS](#) (ARchitectures de bolomètres pour des TÉlescopes à grand champ de vue dans le domaine sub-Millimétrique au Sol)  
[CONCERTO](#) (CarbON CII line in post-rEionisation and ReionisaTiOn epoch)  
[LASMA](#) (Large APEX Sub-Millimetre Array)  
[nFLASH](#) (new FaciLity APEX Submillimetre Heterodyne receiver)  
[SEPIA](#) (Swedish ESO PI receiver for APEX)

**IMPORTANT:** ESO proposals must be submitted using the web-based tool [p1](#). Further details can be found in this Call and in [The ESO Messenger \(2019, v. 176, p. 41\)](#). In addition, as previously [announced](#), ESO is now requesting all science users to provide more detailed information in their User Portal profile. Users failing to do this will not be able to submit a proposal as PI and/or as CoI. Furthermore, restrictions imposed by the global COVID-19 pandemic may result in changes to the content and conditions provided in this Call that cannot be foreseen at the time of writing. In particular, runs scheduled in Visitor Mode during Period 109 may need to be executed

in Designated Visitor Mode if travel restrictions are in place.

Further information can be found via the [Phase 1](#) webpage. Details on the instruments and ESO facilities offered in Period 109 can be found on the La Silla Paranal Observatory [Call for Proposals](#) webpage. The main characteristics of all Period 109 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:

**23 September 2021,  
12:00 noon Central European Summer Time.**

Please note that it is the responsibility of the Principal Investigator (PI) to resolve any problems related to the submission of their proposal well before the deadline. ESO cannot provide support beyond 11:00 CEST on the day of the deadline. No submissions or amendments to submitted proposals can be accepted after 12:00 CEST.

In each submitted proposal, one single person, namely the PI, is the primary responsible. Submitting a proposal implies that the PI and their 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. PI and all co-Is must be registered in the ESO User Portal and will all receive an email notification when they are added to (or removed from) the proposal.

Any questions about policies or the practical aspects of proposal preparation, including technical requirements of the planned observations, should be sent to ESO via the [ESO Helpdesk](#).

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, while 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 107 and 108)

### 1.1.1 General

- **Proposal anonymisation:** Period 108 marked the full deployment of the Dual-Anonymous Peer Review (DAPR) in the evaluation of proposals for observations at ESO telescopes. Applicants must formulate the scientific rationales of their proposals following the anonymisation rules and examples described [in this link](#), which also gives a detailed description of the DAPR paradigm. While Period 106 was used as a dry run, both to make the community aware of the upcoming implementation of DAPR and to test its practical, procedural and policy aspects, from Period 108 proposal anonymisation is mandatory. Failure to abide by the DAPR rules may lead to the disqualification of the proposal.

The field **Background and Expertise** is the only field of the proposal in which information on the proposing team can be disclosed. This field – as well as the fields **Investigators**, **Previous Usage** and **Applicants' Publications** – will not be included in the material distributed to the referees during the proposal review phase, and will only be accessible to them after the ranking phase is completed.

- **Large Programmes (LP):** [Large Programme](#) proposals are only accepted in even Periods, *i.e.*, Periods with proposal submission deadline in March or April.



- **Facility changes:** Changes in any of the technical capabilities of the full ESO instrument suite in Period 109 can be found via the [Recent Changes in Instrumentation](#) webpage. Before writing a proposal for a given instrument, users are urged to check the instrument's news webpage covering details not contained in this Call (*e.g.*, for X-SHOOTER: <https://www.eso.org/sci/facilities/paranal/instruments/xshooter/news.html>).
- **Invitation to submit proposals for larger Normal Programmes:** ESO encourages the community to submit proposals for Normal Programmes making use of the full allowed range for the total requested time, *i.e.*, up to 99 hours (199 hours for nFLASH at APEX if requesting PWV > 2 mm, see Sect. 1.1.4). ESO has been actively working to ensure that the distribution of requested time is matched, after the allocation and scheduling processes, by the distribution of allocated time, thus guaranteeing that proposals of all lengths have equal chances of success.
- **Guaranteed Time Observations (GTO):** GTO will be carried out in Period 109 with **GRAVITY** and **MATISSE** (UTs and ATs), **NAOMI** (ATs) on any VLTI instrument, as well as with **CRIRES**, **ESPRESSO**, **MUSE**, **ULTRACAM**, **HARPS** and **ARTEMIS**. Please see Sect. 4.4 for information on the number of nights allocated to GTO programmes in Period 109. For details about the protected targets, please see: <https://www.eso.org/sci/observing/teles-alloc/gto/109.html>.

### 1.1.2 Paranal

- **Rapid Response Mode (RRM) activation policy:** The RRM policy changed starting in Period 105: on-going observations on any VLT instrument can be interrupted by an RRM triggered on that specific UT, even if the trigger requires a change of focus, unless the relevant programme is specifically protected against an RRM trigger (in case of strictly time-critical programmes). The change is currently being tested and is expected to be fully operational by Period 109. Users are encouraged to read Sect. 4.7.2, which describes in more detail this new aspect of the RRM policy.
- **VLT-XMM proposals:** Proposals are invited for scientific programmes requiring both VLT(I) and XMM-*Newton* observations (see Sect. 4.10 for further details). These proposals may be submitted for the next XMM-*Newton* cycle, which extends over ESO Periods 109 and 110. However, proposers should take the limited availability of some of the VLT(I) instruments in Periods 109 and 110 into account; see Sects. 4.3 and 1.3 for details on instrument availability. Users should submit their proposal selecting the Normal programme type and specifying in the **Special Remarks** field of the [p1](#) proposal preparation tool that the proposal is a joint VLT-XMM proposal.
- **Distribution of UT instruments:** For Period 109 the distribution of offered instruments on the UT foci is shown in Table 1. ESPRESSO can be operated from any of the four UTs in 1-UT mode and employs the four UTs simultaneously in 4-UT mode.

	Nasmyth A	Cassegrain	Nasmyth B
UT1	Visitor Instrument (Sect. 3)	<a href="#">FORS2</a>	<a href="#">KMOS</a>
UT2	<a href="#">FLAMES</a>	<a href="#">VISIR</a>	<a href="#">UVES</a>
UT3	<a href="#">SPHERE</a>	<a href="#">X-SHOOTER</a>	<a href="#">CRIRES</a>
UT4 - AOF	<a href="#">HAWK-I</a>		<a href="#">MUSE</a>
ICCF	<a href="#">ESPRESSO</a>		
VLTI	<a href="#">GRAVITY MATISSE PIONIER</a>		

Table 1: Distribution of offered UT instruments in Period 109.

- **Remarks on UT instruments:**

- The UT1 Nasmyth A focus is available for a **Visitor Instrument** during Period 109.
- Since August 2021, [VISIR](#) has been mounted at the UT2 Cassegrain focus, and is again available as of Period 108.
- [CRIRES](#): The upgraded instrument has been successfully commissioned and is offered to the community with the spectroscopy mode covering the wavelength range 0.95–5.3  $\mu\text{m}$ , with spectral resolving powers of 50,000 and 100,000, and in noAO and NGS modes. A set of two gas cells allows high-precision radial velocity measurements. Starting in Period 109, the following modes are available: classical spectroscopy, spectro-polarimetry, spectro-astrometry, differential tracking, and generic offsets.
- The extension of the limiting *J*-band magnitude for the GALACSI NFM Low Order Infrared Sensor reference star (tip-tilt star) to 18.5 mag was commissioned and is fully available. For a turbulence category of 10% and airmass less than 1.2 the limiting *J*-band magnitude is 19.0. Details will be available on the news page of [MUSE](#).
- [ESPRESSO](#): Since Period 107, ESPRESSO is offered with the 4x2SLOW binning and readout scheme in high resolution mode. This configuration is suited to science cases that involve very low S/N while using only one UT.

- **Remarks on Survey Telescopes:**

- [OMEGACAM](#) at the VST is no longer offered.
- Period 109 is expected to be the last Period of [VIRCAM](#) operations before the start of the modifications required at VISTA for the installation of [4MOST](#).
- Target of Opportunity (ToO) proposals are accepted for [VIRCAM](#).

- **Remarks on VLTI operations:**

- **Support for VLTI proposals:** For VLTI users needing assistance to prepare their VLTI proposals, the community-supported [VLTI Expertise Centres](#) – distributed throughout Europe – can offer in-depth support. They also offer support for observation preparation, advanced data reduction and analysis.
- **VLTI imaging:** In Period 109, ESO will continue a scheme to optimize operations for aperture synthesis (imaging) with the VLTI. This scheme only applies to Service Mode observations with the ATs. The reader is referred to the Period 109 [VLTI manual](#) for imaging requirements: observing mode, minimum requested time and minimum time range. It is highly recommended to request imaging in SM. Imaging proposals requesting VM are expected to present a strong justification.  
 Since Period 108, ESO has introduced imaging slots (ISLs) in the VLTI-AT telescope schedule, in order to further improve the efficiency of VLTI imaging observations. ISLs are periods of about two weeks of uninterrupted service mode, with flexibility on the exact dates to change the AT configurations. The ISLs are specifically set aside and centred around new moon in February, May, August and November of every year. PIs of GTO programmes, Large Programmes and programmes requiring Visitor Mode are requested to adhere to this restriction for their planning. ISLs are primarily intended to support imaging observations, but they are not restricted to this type of VLTI observations. ISLs are regular SM time, and OBs are executed according to their priority. Likewise, imaging observations are not restricted to ISLs, but can be completed in SM time outside of the ISLs.
- **Relocation configurations:** For operational reasons, observations may occasionally take place on relocation configurations during a transition between two standard configurations. A criterion of at least 50% baseline length overlap will be used. This scheme will be primarily used for imaging runs. The overlap in baseline length between standard and relocation configurations is detailed in the [VLTI Configurations Overview](#) webpage.
- **VLTI-UT operations:** The first phase of the recoating of the four UT Coudé trains is expected to take place early in Period 109. No recoating activities are foreseen later in Period 109, but they will continue in Period 110.

- **Remarks on VLTI instruments:**

- **GRAVITY (astrometric measurements):** ESO invites proposals with the goal of performing astrometric measurements, a capability which is still under development (see, *e.g.*, the following articles: [Gravity collaboration, 2017, A&A 602, A94](#) and [The Messenger 170, 10](#)). Proposers who wish to use the astrometric capability and contribute to its development are invited to consult the [GRAVITY](#) webpage and contact the [astrometric team](#) at least two weeks before the proposal submission deadline.
- **MATISSE** is offered in Period 109 on the UTs (supported by the visible MACAO AO system), and on the short, medium and large AT configurations in Service and Visitor modes. MATISSE is offered with restricted use of GRAVITY as an external Fringe Tracker in the so-called GRA4MAT mode on the ATs fully, and on UTs without chopping (no N-band photometry) only.

### 1.1.3 La Silla

- **Distribution of La Silla instruments:**

In Period 109 the distribution of offered instruments on the La Silla foci will be:

- **3.6-m:**
  - \* Cassegrain (fibre-fed): [HARPS](#)
- **NTT:**
  - \* Nasmyth A: [SOFI](#)
  - \* Nasmyth B: [EFOSC2](#)
  - \* Nasmyth B: [ULTRACAM](#)
- **NIRPS:** the Front End Adaptive Optics and the Back End of the Near Infra-Red Planet Searcher continues to be commissioned at the 3.6-m telescope in Period 109. The installation of NIRPS is not expected to affect the operation of HARPS in Period 109.
- The Visitor (Cassegrain) focus of the 3.6-m telescope is not offered during Period 109 due to the installation and commissioning of [NIRPS](#). The possibility of offering this visitor focus will be re-evaluated in the future.
- **ULTRACAM:** This PI instrument is offered to the ESO community for up to 5% of the observing time at the NTT in Period 109. Operation of this PI instrument requires the presence of the instrument team, so ULTRACAM programmes will preferentially be scheduled contiguously on periods of several nights. 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 telescope time with ULTRACAM. The ULTRACAM team will support the execution of the observations and the subsequent data reduction to allow the scientific exploitation of the data obtained with ULTRACAM. Proposers must check that their planned observations do not duplicate any protected targets specified for ULTRACAM in the [Period 109 GTO target protection](#) webpages.

### 1.1.4 Chajnantor

- **ESO time:** At the time of writing, ESO's observing time slots in Period 109 have not yet been determined. Users are encouraged to check the latest version of the schedule [here](#). Time critical observations can only be executed during ESO time. For a detailed description of the APEX instrument capabilities and links to observing time calculators, see the [APEX instrumentation](#) webpage.
- **ARTEMIS:** In Period 109, both the 350  $\mu\text{m}$  and 450  $\mu\text{m}$  channels are offered for simultaneous observations. This instrument is optimised for wide-field mapping of areas of at least  $4' \times 2'$ ,

and achieves similar mapping speeds at both wavelengths. An observing time calculator is available at <https://www.apex-telescope.org/bolometer/artemis/obscalc/>.

- **CONCERTO:** This PI instrument covers a circular field of view of 20 arcminutes, with a spectral resolution that can be chosen from  $R \sim 1$  (dual-band photometer) to  $R = 300$ . The frequency ranges are 130 to 270 GHz in the low frequency array and 195 to 310 GHz in the high frequency array, which are obtained simultaneously. For more details, see <https://www.apex-telescope.org/ns/concerto/>. Prospective users should contact the instrument PI, Guilaine Lagache (guilaine.lagache[AT]lam.fr) at least 2 weeks before the proposal deadline, and should include at least one member from the CONCERTO instrument team as CoI on the proposal. An observing time calculator script is available from <https://mission.lam.fr/concerto/pages/instrument.html>.
- **LASMA:** This PI instrument has seven pixels with an RF range from 268 to 375 GHz in two sideband-separating bands covering 4 to 8 GHz IF. LASMA is offered to the ESO community on a collaborative and best effort basis with MPIfR. Users who would like to use LASMA must contact the instrument PI, Dr. Friedrich Wyrowski (wyrowski[AT]mpifr-bonn.mpg.de) at least two weeks prior to submitting their proposal. Members of the PI team should be included as CoIs on the proposal.
- **nFLASH:** This facility instrument contains two receivers: nFLASH-230, covering from 200 to 270 GHz, and nFLASH-460, covering from 385 to 500 GHz. Both are dual polarisation 2SB receivers, and can be used simultaneously or independently in Period 109. The nFLASH-230 receiver has a IF bandwidth coverage of 8 GHz with a gap of 8 GHz between the two sidebands; the nFLASH-460 receiver has a IF bandwidth coverage of 4 GHz per sideband. The backends are digital 4th generation Fourier Transform Spectrometers (dFFTS4G) with 24 GHz bandwidth. An observing time calculator is available at <http://www.apex-telescope.org/heterodyne/calculator/ns/index.php>.
- **SEPIA:** This instrument houses three ALMA-type 2SB dual polarization receiver cartridges: SEPIA-180 (ALMA Band 5) covering from 159 to 211 GHz; a new SEPIA-345 (ALMA band 7) receiver covering from 272 to 376 GHz; and SEPIA-660 (ALMA band 9) covering from 578 to 738 GHz (note the extended frequency coverage with respect to the ALMA band 9 receivers). All receivers are available for Monitoring programmes. All receivers use the dFFTS4G backends, covering the 4 GHz (for SEPIA-180) or 8 GHz IF bandwidth with a gap of 8 GHz between the image and signal bands. An observing time calculator is available at <http://www.apex-telescope.org/ns/observing-time-calculators/>.

## 1.2 Important reminders

### 1.2.1 General

- **ESO User Portal:** Proposals are submitted via the [p1](#) proposal preparation tool. It requires users to log in with their ESO [User Portal](#) credentials. **Further, all CoIs are required to have an updated ESO User Portal account. PIs will add CoIs to their proposals by submitting the CoI's email address. Therefore, both PIs and CoIs are required to keep their affiliations and e-mail addresses up-to-date in the ESO User Portal.**
- **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 support:** Since Period 105, and in order to improve the chances of proposal success, ESO encourages users to team up with, or seek advice from, members of the community who have submitted successful proposals in the past. As an additional option, users may also want to consider collaborating with ESO scientists with expertise on the scientific subject of their proposal. PIs interested in the latter option should send an email to

[science\\_p1support@eso.org](mailto:science_p1support@eso.org) with a title and abstract of their proposal, at least three weeks before the proposal submission deadline. This information will be seen by interested ESO scientists and treated as confidential.

- **Observing conditions:** The definitions of the observing conditions for Phase 1 and Phase 2 can be found on the [Observing Conditions](#) webpage. Mistakes in, *e.g.*, the lunar illumination requirement cannot be corrected after the deadline.
- **Any-weather proposals:** ESO strongly encourages programmes that can effectively exploit the worst observing conditions on the VLT. More specifically, ESO invites proposals that request turbulence category 85% or 100%, thin/thick clouds and have no moon constraints.
- **Justification of requested time and observing constraints:** Users must provide in the `Time Justification` field of the proposal all details necessary to reproduce their ETC calculations to justify the time and observing constraints requested. Failing to do so may result in the Observatory concluding that the programme is not feasible. Further justification of the observing constraints can be provided in the `Lunar Phase and Constraints Justification` field.
- **Policy on requests for changing or adding targets:** Teams asking for observations that envision the need for additional or a change of targets, or for adapting their observing strategy after the start of the Period (following, *e.g.*, Gaia data releases), must declare it with a note in the `Special Remarks` field of the proposal. The note must include the time scale and the expected cadence of the target change requests. In addition, the proposals must provide scientific and technical justifications for such approach in their rationale and `Time Justification` field. The request will undergo a scientific review by the OPC and a technical feasibility assessment by the Observatory. Proposals that are scientifically highly ranked and can be supported in terms of target list changes and strategy requirements will be considered for scheduling.

Please note that, as a rule, targets or instrument setup changes requested after proposal approval are not protected against target duplication from other programmes. Deviations from this rule will only be considered under exceptional circumstances, and will be treated in the same way as requests for extensions of the proprietary period.

- **Duplications:** Proposers must use the [Science Archive Facility](#) to check if observations equivalent to the proposed ones have been performed already. Proposers must also check that their planned observations do not duplicate Guaranteed Time proposals (see [GTO Plans for Period 109](#)) and ongoing [Public Survey](#) observations.
- **Target protection for Large GTO Programmes:** Since Period 100, Large GTO Programmes can span up to four Periods. This implies that such programmes can submit target protection lists that may be valid for a maximum of four Periods for targets that will effectively be observed. However, their nominal proprietary period remains with a maximum of one year starting as soon as the data have been ingested into the ESO Archive. Exceptions to this rule must be authorised by the Director General, and must be requested before the proposal is submitted.

### 1.2.2 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 offered by this mode. Visitor mode runs are encouraged for those users who have never visited Paranal, even if the observations are straightforward. Users should make use of the `Mode Justification` field of the proposal to justify their preferred mode or why an alternative mode should also be considered. 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 Observation Blocks (OBs):** Service Mode OBs including all [overheads](#) can last up to a maximum of one 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:** If pre-imaging is required, 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 proposal (see Sect. 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 unavailability. 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.
- **Rapid Response Mode** is offered for specific instrument modes on FORS2, UVES, X-SHOOTER, SPHERE, HAWK-I and MUSE in Period 109. 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 Sect. 4.7.2 for details on the renewed RRM policies related to focus changes.
- **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 astronomer with the following exception: up to approximately 30 minutes per night can be used by the observatory staff to obtain standard ESO calibrations. The calibrations 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. 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 webpage: [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](#).



### 1.2.3 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 Sect. 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 three 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, with the following exceptions:
  1. There is no minimum duration for runs to be carried out with Visitor Instruments (see Sect. 3). However, in order to minimise the overheads associated with their installation and removal, such instruments are normally scheduled in blocks combining several contiguous runs. The length of these combined blocks should be typically at least three nights, and runs may be rejected at scheduling if this condition cannot be met.
  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. Users applying for such combined runs should select either EFOSC2 or SOFI, and add a note in the **Special Remarks** field of the proposal that they wish to use both instruments.
  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 next item and Sect. 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 Sect. 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 (see also Sect. 5.1.2). The three-night minimum length per run remains. Due to the reduced operations at La Silla, DVM is offered 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 using the [p2](#) web interface 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 ESO through the [ESO Helpdesk](#) **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 ESO through the [ESO Helpdesk](#) to check the feasibility of such observations for your programme.

### 1.2.4 Chajnantor

- **APEX** is offered in Service Mode only. Proposals requesting time from different APEX partners must mention the amount of time requested from MPIfR, Sweden or Chile in the **Special Remarks** field. 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 (*i.e.*, ARTEMIS and SEPIA-660) should avoid the afternoon. APEX users should ensure that their proposal meets the following requirements:

- specify if time is requested from other APEX partners, using the **Special Remarks** field;
- specify the requested PWV when configuring the run in **p1**, 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.

### 1.3 Changes foreseen in the upcoming Periods

- **MOONS** – the Multi-Object Optical and Near-infrared Spectrograph – is expected to be installed at the UT1 Nasmyth A focus during the third quarter of 2023.
- The VLT **Visitor Focus** at UT1 will remain available during Periods 110 and 111. However, activities related to the installation of MOONS may impose time restrictions. Interested users should contact [paranal@eso.org](mailto:paranal@eso.org).
- With the availability of superior VLT capabilities, the IFU mode of **X-SHOOTER** is expected to be decommissioned towards the end of Period 110 or during Period 111.
- **ERIS**, the Enhanced Resolution Imager and Spectrograph, is expected to be installed and commissioned during 2022 at the UT4 Cassegrain focus. Pending successful commissioning, ERIS might be offered in Period 111.
- **4MOST** is expected to be installed in Period 110, leading to the decommissioning of **VIRCAM**.
- Depending on successful commissioning, **NIRPS** is expected to be offered in Period 111.
- **SOFI** is expected to be decommissioned in Period 110 for the installation and commissioning of **SoXS**, while **EFOSC2** will be decommissioned once **SoXS** enters regular operations on the NTT, which is expected for Period 111.
- ESO does not plan to offer APEX after Dec. 31, 2022, corresponding to the end of the current APEX agreement.

## 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 or turbulence parameter, 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 summarised 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 demo version of the web-based tool **p2** for La Silla and Paranal observations.

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. Instrument specific performance and observing conditions, in particular for VLTI and Adaptive Optics instruments, are described in the respective User Manuals and only briefly summarised on the Observing Conditions webpage.



The following sections give some additional information and references that should be useful to proposers. Proposers are also encouraged to consult tutorials and p1-related videos from the LPO Users Workshop available at <https://eso.org/sci/meetings/2021/Users-Workshop1.html>.

## 2.1 Support for VLTI programmes

For VLTI users needing assistance to prepare their VLTI proposals, the community-supported [VLTI Expertise Centres](#) – distributed throughout Europe – can offer in-depth support. They also offer support for observation preparation, advanced data reduction and analysis.

## 2.2 Exposure Time Calculators

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

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

Proposers of VLTI observations with PIONIER should check the feasibility of their proposed observations with the visibility calculator, VisCalc, available from the [ETC page](#). Visibility calculations for GRAVITY and MATISSE are included in the dedicated GRAVITY and MATISSE ETCs. 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 see:

<https://www.apex-telescope.org/ns/instruments>.

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

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

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

<https://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 `Time Justification` field of their proposals.

Users should follow the appropriate link in the [ETC page](#) to make sure they are using the correct ETC version for their proposals for Period 109. Please note that while the sky background values used in the ETCs generally reflect actual conditions on Paranal, the almanac mode, added to ETCs in Period 101, needs to be used to account for local effects such as those from zodiacal light.

Service Mode proposers are reminded that the requested observing conditions are binding in Phase 2 (see Sect. 6.5). The ETCs were modified in Period 96 and require the seeing in the V band at zenith in order to properly 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.

## 2.3 The p1 proposal submission tool

All Phase 1 proposals must be prepared and submitted using the new, web-based proposal submission tool, [p1](#). The L<sup>A</sup>T<sub>E</sub>X ESOFORM has been retired. Further details can be found in Sect. 1.1 and in

[The ESO Messenger \(2019, v. 176, p. 41\)](#), or online in the [p1 introduction](#) webpage. Users are encouraged to get familiarised with the new system using the [p1demo](#).

### 2.3.1 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 observing 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 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 are unlikely to be taken into account by the scheduler. **Retrofitting scheduling constraints after the release of the schedule is not possible.**
- **Proposal resubmissions:** If the proposal is a re-submission of an old proposal then the **OPC comments must be addressed** in this new submission.
- **VLT observation type:** For each observing run, one or more observation types that best describe the proposed observations **must be specified**:
  - snapshot: standalone concatenations without further links to other observations in terms of time links or filling the uv plane; these concatenations are CAL/SCI, CAL/SCI/CAL or CAL/SCI/CAL/SCI/CAL, depending on what each instrument offers;
  - time series: time series of concatenations that are repeated once or more often over the period;
  - imaging: a set of concatenations with different baseline configurations to fill the uv plane for the purpose of image reconstruction; in this case special care is taken at execution to uniformly fill the uv plane; it is highly recommended to request imaging in SM; imaging in VM should have a strong science case justification;
  - astrometry: GRAVITY dual-feed observations with the purpose of extracting astrometric information.
- **Naming convention for AT configurations:** AT configurations are requested by generic names (“Small”, “Medium”, “Large” and “Astrometric”) rather than explicit configurations. The standard configurations should be used for Phase 1 and Phase 2 preparation and are detailed for a given period in the [VLT Configurations Overview](#) webpage.
 

For operational reasons, observations may occasionally take place on relocation configurations during a transition between two standard configurations. A criterion of at least 50% baseline length overlap will be used. This scheme will be primarily used for imaging runs. The overlap in baseline length between standard and relocation configurations is detailed on the aforementioned webpage. In addition, observations requesting the Large AT configuration may occasionally be executed on the Astrometric configuration in order to streamline operations.
- **Precipitable water vapour (PWV) constraints:** PWV constraints must be specified for all instruments when adding or editing runs in [p1](#).
- **VLT-XMM proposals:** Proposers must indicate in the **Special Remarks** field if they are applying for VLT-XMM time under the ESA-ESO agreement (see Sect. 4.10). VLT-XMM proposals may include observing runs to be executed in Period 109 and/or 110.

## 2.4 Proposal Submission

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

**23 September 2021,  
12:00 noon Central European Summer Time.**

Proposal submission is done via the new web-base tool p1 at:

<https://www.eso.org/p1>.

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 preparation and submission of the proposal early, as ESO cannot provide support for proposal submissions after 11:00 CET 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 plan ahead. Over past Periods, congestion of the proposal submission system has repeatedly occurred in the last few hours before the 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 the PI of the proposal will receive a confirmation e-mail. If you are not sure if your proposal has been successfully submitted, contact ESO through the [ESO Helpdesk](#).

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

## 3 Visitor Instruments

In Period 109, visitor instruments can be mounted at the VLT, NTT, 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.

ESO also offers two foci in the VLTI laboratory to house interferometric instruments.

At the VLT, the Nasmyth A focus of UT1 is available during Period 109. Proposers should keep in mind that the start of preparatory work for the arrival of MOONS limits the availability of the visitor focus during Period 110 and beyond.

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:

- For the VLT: [Visitor Focus](#) and [Applications for Use of the VLT Visitor Focus](#)
- For the VLTI: [Visitor Focus](#) and [Applications for Use of the VLTI Visitor Focus](#)
- For the NTT: [Visitor Focus](#)
- For APEX: [Visitor Focus](#)

## Part II

# Proposal Types, Policies, and Procedures

## 4 Proposal Types

For Period 109 the programme types offered are:

- Normal Programmes
- Monitoring Programmes
- Guaranteed Time Observations
- Calibration Programmes
- Director’s Discretionary Time

Target of Opportunity observations are requested strictly as ToO runs pertaining to any programme type (except Monitoring Programmes). See Sect. 4.7 below for details.

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

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 (Sect. 5.1) must request time in nights, whereas proposals for **Service Mode** observations (Sect. 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 Sect. 2.3.1.

**Please note:** All proposers (Service and Visitor Mode) must include time for all overheads (telescope + instrument) in their proposals (see the [Overheads](#) webpage). For both La Silla and Paranal instruments, the [p2 demo](#) web interface can be used to prepare mock observations and estimate the total execution time including overheads.

### 4.1 Normal Programmes

Most of the observing time on ESO telescopes will be allocated to **Normal Programmes** in Period 109. Normal Programmes are limited to a time request of less than 100 hours and available instruments are listed in Table 2. Proposers must upload a PDF file containing the scientific rationale of the proposal. Templates and further instructions to produce this file are available at the [p1 help](#) webpages. 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, although 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 three nights, except for runs using Visitor Instruments or for combinations of contiguous EFOSC2 and SOFI runs (totalling at least three nights). In certain cases exceptions may be made for highly-ranked La Silla runs that require Designated Visitor Mode observations; see Sect. 5.1.2 for more details.

Table 2: Available Instruments for Normal Programmes

Telescope/Combined Focus	Instrument
UT1	FORS2, KMOS, VISITOR <sup>1</sup>
UT2	FLAMES, VISIR, UVES
UT3	CRIRES, SPHERE, X-SHOOTER
UT4	HAWK-I, MUSE
ICCF	ESPRESSO <sup>2</sup>
VLTI	GRAVITY, MATISSE, PIONIER, VISITOR
VISTA	VIRCAM
NTT	EFOSC2, SOFI, ULTRACAM, VISITOR
3.6	HARPS
APEX	ARTEMIS, CONCERTO, LASMA, nFLASH <sup>3</sup> , SEPIA <sup>4</sup> , VISITOR

<sup>1</sup> The Nasmyth A focus is available for a Visitor Instrument. See Sect. 3.

<sup>2</sup> ESPRESSO in 1-UT mode can be operated from any of the 4 UTs. The 4-UT mode is only offered in Visitor Mode and observations are scheduled in groups of consecutive nights; users must request a total time that is an integer multiple of half-nights (corresponding to five hours in Period 109), with a minimum duration for each individual observing slot of one half-night.

<sup>3</sup> nFLASH-230 and nFLASH-460 are offered.

<sup>4</sup> SEPIA-180, SEPIA-345 and SEPIA-660 are offered.

## 4.2 Monitoring Programmes

Monitoring Programme (MP) proposals enable users to request a limited amount of time to monitor targets over more than one Period. Proposers should select the corresponding programme type when creating their proposal in [p1](#). Monitoring Programmes are only accepted on some instruments (see Table 3).

An ESO MP is defined by the criteria listed below.

- A programme requiring less than 100 hours of ESO telescope time (199 hours for nFLASH at APEX if requesting PWV > 2 mm). For ESO telescopes, one night in Visitor Mode is defined to be eight hours in even Periods and ten 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 set) in order to enable observations within time-linked scheduling containers.
- MP proposals must request a minimum of two Periods and can span up to four consecutive Periods.
- MP proposals will be evaluated 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 (see Sect. 1.1.4).
- All ToO run types can be submitted as part of Monitoring Programmes (see Sect. 4.7).

## 4.3 Restrictions to Monitoring Programmes

During Period 109, the following restrictions apply for Monitoring Programmes (see Table 3). The rationale behind these restrictions is the following:

Table 3: Available Instruments for Monitoring Programmes

Telescope/Combined Focus	Instrument
UT1	FORS2, KMOS
UT2	FLAMES, VISIR, UVES
UT3	SPHERE, X-SHOOTER
UT4	HAWK-I, MUSE
ICCF	ESPRESSO <sup>1</sup>
VLT	GRAVITY, MATISSE <sup>1</sup> , PIONIER
APEX <sup>2</sup>	ARTEMIS, CONCERTO, LASMA, nFLASH, SEPIA

<sup>1</sup> Restrictions apply (Sect. 4.3).

<sup>2</sup> APEX observations for approved Monitoring Programmes can only be carried out in the ESO time slots (Sect. 1.1.4). MPs for APEX cannot include runs for Period 111, as the telescope operations are not planned to go beyond Period 110.

- **CRIRES:** The instrument is not yet offered for MPs as its performance needs to be consolidated.
- **ESPRESSO:** ESPRESSO in 1-UT mode only is offered for MPs.
- **MATISSE:** The instrument is offered for MPs except with the new HIGH+ setting or the new GRA4MAT mode, which requires further characterisation.

#### 4.4 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](#)).

GTO teams should submit their proposals specifying the GTO Programme Type and the appropriate GTO contract keyword.

All GTO proposals will be evaluated and ranked together with Normal 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. GTO policies are summarised in the ESO Council document [Cou-1847](#).

GTO runs must be conducted in Visitor Mode (Sect. 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 VLT baselines or instruments). Some GTO programmes require ToO runs<sup>1</sup> (see Sect. 4.7.1). The table in the next page provides a detailed description of the current commitment to GTO consortia.

#### 4.5 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 specialised 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

<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.

GTO Contract	Telescope	Instrument	First Period	Last Period	Total entitlement (nights)	Remaining time (nights) <sup>(1)</sup>	Time in P109 (nights) <sup>(2)</sup>
ARTEMIS-consortium <sup>(7)</sup>	APEX	ARTEMIS	95		<sup>(3)</sup>	-	
CRIRES-consortium	UT3	CRIRES+	108	113	62	51,0	10
ESPRESSO <sup>(4)</sup>	UT	ESPRESSO	102	110	273	47,7	24
INAF-OAC-UT	VLT	ALL	93	109	28	0,6	1
GRAVITY-consortium-UT <sup>(6)</sup>	VLTI-UT	GRAVITY	99	109	68,25	15,7	16
GRAVITY-consortium-AT	VLTI-AT	GRAVITY	97	109	157	70,8	71
LFC-consortium	3.6m	HARPS	102	111	80	16,7	6
MATISSE-consortium-UT <sup>(6)</sup>	UT	MATISSE	103	113	37,5	19,1	4
MATISSE-consortium-AT	AT	MATISSE	103	113	173	111,6	22
MUSE-consortium	UT4	MUSE	93	109	255	0,9	1
NAOMI-consortium	AT	ALL-VLTI	105	111	28	23,1	8
VISA-MPG	VLTI	GRAVITY	79	109	69	16,0	16

(1) At the start of ESO Period 109. Corrected for the losses in P105.

(2) Average forecast: (remaining time)/(remaining semesters).

(3) The entitlement is 15% of the total science time for the whole duration of ARTEMIS operations. This corresponds to a maximum of 36 hours per semester.

(4) Nights with 1 UT.

(5) The entitlement is a fraction of the total science time for 10 years of operations.

(6) Nights with all 4 UTs.

(7) Times are expressed in hours for APEX.

**NOTE:** For P109 the accounting is indicative. Losses in P106 and P107 are not accounted for.

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 on the [2017 ESO Calibration workshop](#) webpage.

Up to 3% of 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 <https://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 webpages. Scientific publications that make use of the data or results of Calibration Programmes will have to make reference to the corresponding proposals.

Proposers should clearly state in the scientific rationale 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. 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.

#### 4.6 Director's Discretionary Time

Up to 5% of the 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.

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 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 [p1](#) proposal submission tool.

DDT proposals are reviewed by a DDT committee, which issues recommendations to the Director for Science. Urgent requests must be clearly identified in the **Special Remarks** field of the proposal.

## 4.7 Target of Opportunity

Normally, up to 5% of the available observing time may be used for **Target of Opportunity** (ToO) runs. 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 requests for observing time should therefore be submitted as DDT proposals (Sect. 4.6). The ‘TOO’ run type can 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, triggered by the PI. Runs aimed at studying such events through triggers are, in the ESO proposal terminology, ToO runs.

They should be for generic targets and/or times. However, if accepted by the OPC the run will not be executed until the PI (or their 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](#) webpage.

As such programmes may require a mixture of ToO runs and other run types, proposers are requested to specify the type of run in the [p1](#) proposal submission tool.

### 4.7.1 ToO runs

**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 Observation Blocks (OBs) must be submitted by the PI at Phase 2 using [p2](#). Sect. 4.7.2 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. However, before triggering the ToO, the PI of the programme (or one of their delegates) must use [p2](#) to directly update the OB with the relevant coordinates and exposure times, as well as insert configuration files if necessary, and attach a finding chart. The service observer will then execute the specified OB. If real time assessment of the observations can be beneficial for their scientific output, the [Paranal Observatory Eavesdropping Mode](#) can be requested at the time of the trigger; it will then be activated by the service observer at the start of the execution of the OB.

Users submitting a ToO run will need to indicate the number of targets per run and the requested number of triggers per target. 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.

ToO runs are **not** carried over to the following Periods, even if pertaining to Large Programmes. However, ToO observations triggered near the end of a Period will typically be completed even if this implies executing further observations into the upcoming Period.

**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 first trigger for that object by ESO.
- Targets that are unknown at the time of the Phase 1 proposal submission 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.

ESO's policy regarding compensation in case of interrupted observations and other possible issues related to ToO observations can be found on the [ToO policy](#) webpage.

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

During Period 109, ESO offers the VLT Rapid Response Mode (RRM) system for the following instruments: FORS2 on UT1, UVES on UT2, SPHERE and X-SHOOTER on UT3, and HAWK-I and MUSE on UT4.

RRM proposers should note that:

- An RRM trigger is a special ToO trigger that **can only be activated up to 4 hours after an event**. 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 non-ToO run, depending on the classification described above.
- **RRM runs must be exclusively used for triggering the RRM system.** Therefore they must be specified as runs separate from hard or soft ToOs.
- As with any ToO observation, proposers will need to indicate 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 Observation Block (OB) to be executed, any ongoing integration will automatically be terminated and the RRM OB will be executed, unless the procedure is aborted by the operator due to safety concerns. (Note that contrary to ToO triggers, the triggering of RRM observations does not involve [p2](#).) 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 109 are subject to the following conditions:

- An RRM trigger cannot interrupt an already on-going RRM observation.
- RRM triggers will be accepted during Service Mode and Visitor Mode runs. They have overriding priority over other observations, unless the latter are strictly time-critical. This is assessed by ESO before the start of the Period and at the approval of DDT Programmes during the Period, based on information provided in the proposal. The list of RRM-protected runs is available at <https://www.eso.org/sci/observing/teles-alloc/rmm-protected-runs.html>.
- Pending successful commissioning on each UT, the new RRM change-of-focus policy will be extended to all the relevant instruments in Period 108. The old RRM scheme required that the requested instrument must be in use at the moment of the RRM trigger, as the system would automatically reject triggers that require a change of focus. Within the new scheme, if the trigger requires a change of focus, the telescope is expected to point at the location of the target within about 15 minutes following the trigger, due to the additional overhead, instead of about six minutes if the trigger is for an instrument that is already observing.

This new capability implies that any programme may be interrupted by an RRM trigger, except strictly time-critical observations.

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 109, the RRM for SPHERE is only offered in ZIMPOL imaging and polarimetry modes, IRDIS classical imaging mode, and IRDIFS in imaging mode;
- in HAWK-I all filters can be used, but the trigger requesters must follow the User Manual indications closely, as far as brightness restrictions of objects in the field are concerned;
- HAWK-I and MUSE are available in NoAO mode only.

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 contact ESO through the [ESO Helpdesk](#) at least two weeks before the proposal submission deadline.

The delivery of the encoded alerts to Paranal 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 webpage](#).

## 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 CoIs. 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 (except if the PI is affiliated with an institute of the Host State). Non-member state proposals are submitted in the usual way, but a separate set of criteria are used for the review of such proposals (see Sect. 6.1).

## 4.10 VLT-XMM proposals

With the aim of taking full advantage of the complementarity of ground-based and space-borne observing facilities, ESA and ESO have agreed to establish an environment for those scientific programmes that require observations with both the XMM-*Newton* X-ray Observatory and the ESO VLT(I) telescopes to achieve outstanding and competitive results.

By agreement with the XMM-*Newton* Observatory, ESO may award up to 290 ksec (~80 hours) of XMM-*Newton* observing time. Similarly, the XMM-*Newton* project may award up to 80 hours of ESO VLT observing time. **Proposals that request different amounts of observing time on each facility should be submitted to the Observatory for which the greatest amount of time is required.** This applies to the duration of an XMM-*Newton* cycle, which normally extends over two ESO observing Periods. However, proposers should take the limited availability of some of the VLT(I) instruments in Periods 109 and 110 into account. See Sect. 1.1 for more details regarding instrument availability during these Periods.

Proposers wishing to make use of this opportunity will have to submit a single proposal in response to either the [XMM-\*Newton\*](#) or the ESO Call for Proposals: proposals for the same programme submitted to both observatories will be rejected. A proposal to ESO, submitted using [p1](#), will be reviewed exclusively by the OPC. A proposal submitted to the XMM-*Newton* Observatory will be reviewed exclusively by the XMM-*Newton* OTAC. The primary criterion for the award of observing time is that both VLT and XMM-*Newton* data are required to meet the scientific objectives of the proposal. The project does not need to require simultaneous XMM-*Newton* and ESO telescope observations. Target of Opportunity runs and “Triggered Observations” are possible in this co-operative programme. However, proposals requiring simultaneous observation with both facilities, with a reaction time of less than two working days from an unknown triggering date, will not be considered. It is the responsibility of the PI to inform both observatories immediately if the trigger criterion is fulfilled.

It is the proposers’ responsibility to provide a full and comprehensive scientific and technical justification for the requested observing time on both facilities. Both the ESO and XMM-*Newton* observatories will perform feasibility checks of the approved proposals. They each reserve the right to reject any observation determined to be unfeasible for any reason. The rejection by one Observatory could jeopardize the entire proposed science programme.

Apart from the above the general policies and procedures currently in force for the final selection of the proposals, the allocation of observing time, the execution of the observations, and the data rights remain unchanged for both ESO and the XMM-*Newton* Observatory.

## 5 Observing Modes

In Period 109, 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 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: Closing the Loop with the Community*” in the [December 2014](#) issue. More recently, the article “*Should I stay, or should I go? Service and Visitor Mode at ESO’s Paranal Observatory*”, in the [September 2018](#) issue, discusses the advantages of each mode. 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 Sect. 6.3.

The telescope, as well as the instruments, will be operated by observatory staff only. The astronomer interfaces with the telescope and instruments via Observation Blocks (OBs). La Silla and Paranal observers must use the Phase 2 preparation tool [p2](#) for the creation of OBs. Complete information on the preparation of OBs in Phase 2 can be found on the [Phase 2 Observing Preparation](#) webpage.

### 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 VISTA or APEX. For ESO telescopes, one night in Visitor Mode is defined to be eight hours in even Periods and ten hours in odd Periods.

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 are strongly encouraged to prepare their OBs before arriving on the site using the [p2](#) web interface for OB preparation. At the telescope, OBs can be created or further modified in real time (with the exception of the 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](#) webpage). 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 Change Request tab in p2. 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, if no backup programme is in place and Service Mode observations are possible 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](#) webpage.

Although it is very rare, the Observatory may interrupt Visitor Mode observations 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 nights. 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 Sect. 4.7.2). Policies regarding compensation in case of interrupted observations and other possible issues related to ToO observations can be found on the [ToO policy](#) webpage.

### 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 of the programme and Principal Investigators will be informed of their DVM time allocation via the webletters.

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. The web-based tool POEM (Paranal Observatory Eavesdropping Mode) has been offered for observations in Designated Visitor Mode. Details on POEM are available in the [POEM Instructions](#) webpage. More details on DVM, including all requirements concerning the preparation of DVM runs are provided on the [Paranal Sciences Operations](#) webpages. As for normal Visitor Mode runs, users can request additional science targets, instrument setup changes and backup targets. However, such requests must be submitted at least four 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 using the [p2](#) web interface for OB preparation by the Phase 2 deadline, following instructions given at the time of the webletters release; observations will be executed by a telescope operator and contact with the PI is therefore very limited. Please contact ESO through the [ESO Helpdesk](#) **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 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 reviewed by ESO to ensure full optimisation and compliance, and ultimately be accepted.

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 optimise their use of this observing mode, and it should be considered compulsory reading for SM proposers.

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

ESO will absorb all the time required to complete the calibration sequences to the level of accuracy foreseen in the calibration plans 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 a proposal for SM observations and are summarised 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 Sect. 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 (*e.g.*, adjustment of integration times or execution of some OBs instead of others).
- **Observation Blocks (OBs) execution.** 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. It is thus not possible to reduce acquisition overheads by requiring the sequential execution of OBs with the same target field. 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. For Paranal instruments, this can also be done using the [p2 demo interface](#) via a web browser.
- **OB execution times must be below 1 hour.** This rule also applies to concatenated OBs in most cases. Long OBs and long 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 Sect. 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.



- **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](#) webpage.

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 when appropriate. ESO will not restart a sequence of linked observations if the pre-specified timing constraints cannot be fulfilled.

More details on how the p2 tool can be used to time-link, group or concatenate various OBs, are described on the [Phase 2 preparation](#) webpages.

- **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 Sect. 5.2). Most ToO OBs will have to be “dummy” OBs with default values for target coordinates, integration times etc. Since Period 103, at the time of occurrence of the predicted event, the PI of the programme (or one of their delegates) will be required to copy one of the template OBs and provide the missing information. The service observer will update and execute the specified OBs. See the Phase 2 [ToO Procedures](#) webpage for further details.
- **VLTI Imaging Programmes:** PIs of VLTI imaging programmes can request to repeat all observations of a time-critical imaging campaign if it was not finished within the requested time, under the following conditions: (i) the run is A-ranked; (ii) the time interval during which the image needs to be completed (Imaging Time) is specified in the proposal; (iii) the Imaging Time is not shorter than one month, and (iv) the guarantee concerns not more than the ESO-recommended number of uv points for imaging (currently 15 concatenations per target). Possible additional points are taken on a best-effort basis, and expire outside the Imaging Time interval.

## 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 summarise those policies relevant for ESO proposers for Period 109. For details on individual policies we refer proposers to the [ESO Optical/Infrared Telescopes Science Operations Policies](#) 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 credentials. 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.

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

For non-member state proposals (Sect. 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.<sup>2</sup>

The following policy, extracted from the agreement between ESO and its host state Chile, governs the allocation of time to **Host State Proposals** (Sect. 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 through the [ESO Helpdesk](#) 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 the [ESO Helpdesk](#) 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 involves neither a significant increase in the pressure factor on oversubscribed regions of the sky nor a scientific conflict with another, already approved, observation. The request for changes of targets and instrument setup(s), along with the corresponding scientific justification, must be submitted via p2 (for Paranal and La Silla users) or the web-based form available at

<https://www.eso.org/sci/observing/phase2/ProgChange/> (for APEX users).

<sup>2</sup>Proposals from astronomers based in Australia will be considered as proposals from astronomers based in ESO Member States.



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 via the Waiver option of the Change Request tab in p2 (clear instructions are available at <https://www.eso.org/sci/observing/phase2/SMGuidelines/WaiverChanges.html>) at least one week before the Phase 2 deadline (also see Sect. 6.5).

Approved new targets and instrument setups will not be protected against target duplication from other programmes.

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 authorisation has been obtained are not allowed at the telescope.

Observations requiring the use of the Four Laser Guide Star Facility (4LGSF) are subject to the policies described in the [VLT Laser Guide Star Facility Policies](#).

#### 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 Sect. 1.2 would fall under this category.

For Class A runs that are not completed by the end of Period 109, 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. The PIs of all Class A runs will be informed about their eligibility for carryover one month before the proposal submission deadline for Period 110. 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 Programmes 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 as much as possible to increase the chances of their observations 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 Sect. 6.4). Only relaxing observing constraints is allowed at Phase 2. See Sect. 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 or this will not occur automatically. Please be sure to indicate the pre-imaging character of the run by using the corresponding run type in [p1](#). 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

For both Visitor Mode and Service Mode observations, the [ESO Science Archive Facility](#) is the sole access point to data obtained with ESO telescopes. All data obtained with ESO facilities are ESO property, but ESO grants a 12-month proprietary period for science and acquisition data to the PI of the programme, which applies to each data file individually. The proprietary period starts as soon as the data are made available to the PI or respective delegates via the archive, *i.e.*, as soon as the data are ingested, which typically happens a few hours after the observation.

The information contained in the headers of all data files is immediately public. At the end of the proprietary period, the raw data and the abstracts of proposals are made public. In addition, for a selection of instruments (see the [ESO Data Streams](#) webpage), also the reduced data are made public. Exceptions to this ESO [Data Access Policy](#), such as an extension of the proprietary period, may be granted in exceptional cases. The corresponding requests have to be justified in detail and submitted to the Director General for approval. Justifications based only on lack of time and/or resources to complete the data analysis will not be considered. Requesting a shorter proprietary period than the nominal 12 months is possible using the Proprietary Time pull-down menu when adding or editing observing runs in p1. Raw data from Public Surveys, Calibration Programmes and calibration data are not subject to a proprietary period and become publicly available as soon as they are ingested into the ESO Archive.

## 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](#) webpage. 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 Southern Observatory under ESO programme 109.72DG.”*

## 6.9 Press Releases and other communication products

Should you consider that your results are relevant for the wider public or journalists, please consider sending your paper to the Department of Communication ([press@eso.org](mailto:press@eso.org)), preferably no later than when the paper is submitted for publication. Further information can be found [here](#).

ESO reserves the right to use for press releases any data obtained with ESO telescopes as part of programmes with allocated ESO time.

## Part III

# Appendix

## A Acronyms

4LGSF	4 Laser Guide Stars Facility
4MOST	4-metre Multi-Object Spectroscopic Telescope
AOF	Adaptive Optics Facility
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
CIAO	GRAVITY Coudé Infrared Adaptive Optics system for the VLT Interferometer
CoI	Co-Investigator
CONCERTO	CarbON CII line in post-rEionisation and ReionisaTiOn epoch
CRIRES	CRyogenic high-resolution IR Échelle Spectrometer
DDT	Director's Discretionary Time (proposal)
EFOSC2	ESO Faint Object Spectrograph and Camera 2
ERIS	Enhanced Resolution Imager and Spectrograph
ESO	European Southern Observatory
ESPRESSO	Échelle SPectrograph for Rocky Exoplanets and Stable Spectroscopic Observations
ETC	Exposure Time Calculator
FLAMES	Fibre Large Array Multi Element Spectrograph
FORS2	FOcal Reducer/low dispersion Spectrograph 2
GALACSI	Ground Atmospheric Layer Adaptive Corrector for Spectroscopic Imaging
GRA4MAT	GRAVITY fringe tracker used for MATISSE
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
ICCF	Incoherent Combined Coudé Focus
IR	Infrared
IRDIS	InfraRed Dual-Band Imager and Spectrograph
ISAAC	Infrared Spectrometer And Array Camera
ISL	VLTI imaging slot
KMOS	K-band Multi-Object Spectrograph
LASMA	Large APEX Sub-Millimetre Array
LPO	La Silla Paranal Observatory
LST	Local Sidereal Time
MACAO	Multi-Applications Curvature Adaptive Optics
MATISSE	Multi AperTure mid-Infrared SpectroScopic Experiment
MOONS	Multi Object Optical and Near-infrared Spectrograph for the VLT
MPIfR	Max-Planck-Institut für Radioastronomie
MUSE	Multi-Unit Spectroscopic Explorer
NAOMI	New Adaptive Optics Module for Interferometry
nFLASH	new FaciLity APEX Submillimetre Heterodyne receiver
NFM	Narrow Field Mode (a mode of MUSE)
NIRPS	Near Infra-Red Planet Searcher
OB	Observation Block
OMEGACAM	Wide Field Imager for the VST at Paranal
OPC	Observing Programmes Committee
OPO	Observing Programmes Office
p1	web-based phase 1 proposal preparation tool

p2	web-based phase 2 proposal preparation tool
PI	Principal Investigator
PIONIER	Precision Integrated-Optics Near-infrared Imaging ExpeRiment
POEM	Paranal Observatory Eavesdropping Mode
PWV	Precipitable Water Vapour
RA	Right Ascension
RRM	Rapid Response Mode
SEPIA	Swedish-ESO PI receiver for APEX
SM	Service Mode
SOFI	Son of ISAAC
SOXS	Son of X-Shooter
SPHERE	Spectro-Polarimetric High-contrast Exoplanet REsearch
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
VIRCAM	VISTA InfraRed CAMera
VISIR	VLT Imager and Spectrometer for mid-InfraRed
VISTA	Visible and Infrared Survey Telescope for Astronomy
VLT	Very Large Telescope
VLTI	Very Large Telescope Interferometer
VM	Visitor Mode
VST	VLT Survey Telescope
WFM	Wide Field Mode (a mode of MUSE)
X-SHOOTER	UV-Visual-NIR medium resolution échelle spectrograph
ZIMPOL	Zurich IMaging POLarimeter