@ambrozona

How to write an ALMA proposal?

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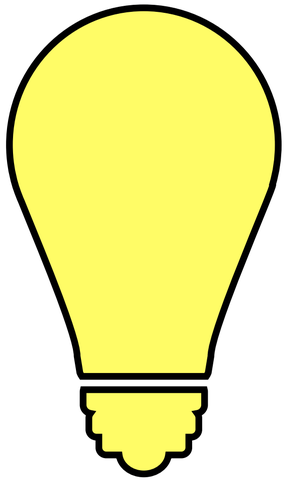
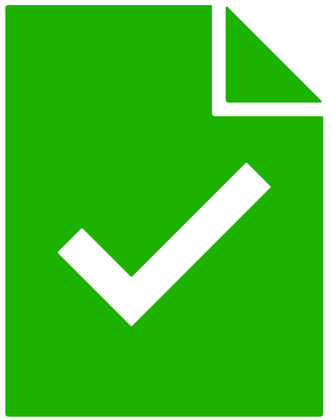
ALMA Local Expertise GROup - ALLEGRO

EUROPEAN ARC
ALMA Regional Centre || Allegro

How to get started?



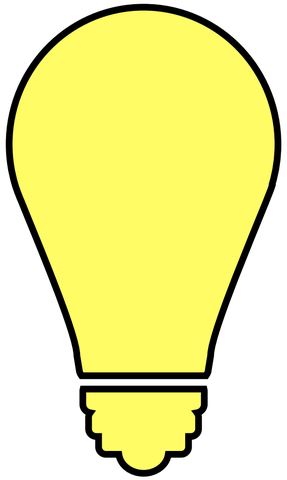


1. Idea

2. Strategy

3. Narrative

1. Idea



1. Idea

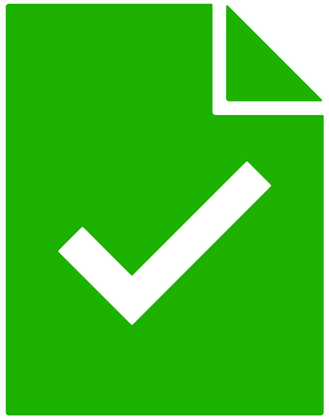
- **new**
  - *Are you trying to make progress?*
- **compelling**
  - *Is it clear to you?*
- **exciting**
  - *Why should others care?*

2. Strategy

2. Strategy

- **feasible**
  - *Is the science achievable with ALMA?*
  - *Is my target observable with ALMA?*
- **reasonable**
  - *Is this doable in finite time?*
- **necessary**
  - *Can the archival data answer your question?*
  - *Is ALMA the best telescope for this particular question?*

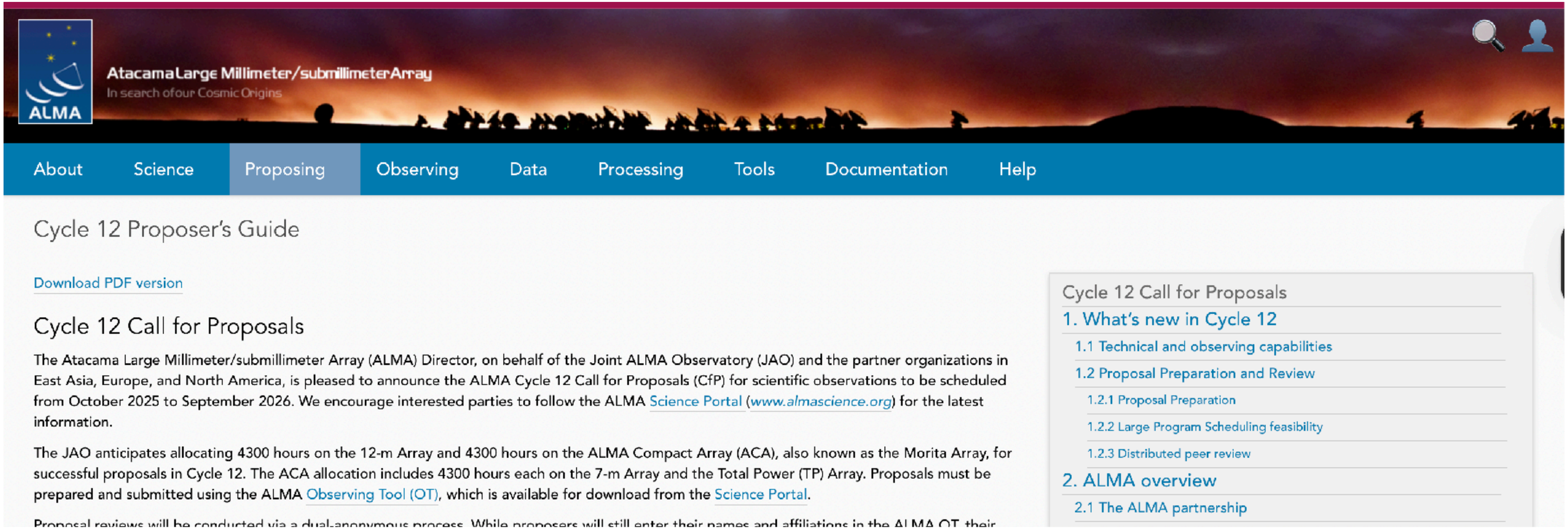
3. Narrative



3. Narrative

- **background**
  - *Is the subject well-researched?*
- **impact**
  - *How will the field be affected?*
- **urgency**
  - *Why now?*

Proposers Guide - up to date informations for the current cycle



https://almascience.eso.org/proposing/proposers-guide

Proposers Guide - up to date informations for the current cycle

- What's new in this cycle?
- What is the timeline?
- Which observations are encouraged?

Date	Milestone
Thursday, 20 March 2025(15:00 UTC)	Release of Cycle 12 Call for Proposals, O opening of the Archive for proposal subm
Thursday, 24 April 2025(15:00 UTC)	Proposal submission deadline for Cycle 1
04 June 2025 (15:00 UTC)	Deadline to submit reviews for the distrib
August 2025	Announcement of the outcome of the pr
01 October 2025	Start of ALMA Cycle 12 Science Observa
30 September 2026	End of ALMA Cycle 12

The main components of the proposal

1. Abstract
2. Scientific Justification
3. Observing Tool setup and Technical Justification

The main components of the proposal

1. **Abstract**
2. Scientific Justification
3. Observing Tool setup and Technical Justification

Abstract structure example

Proposal 2019.1.00061.S, PI: Richard Ellis

Determining the period when the first galaxies emerged from a dark intergalactic medium represents a fundamental milestone in assembling a coherent picture of cosmic history. Recent surveys of z~7-9 galaxies have revealed a population whose red Spitzer IRAC colours either indicate contamination from intense optical emission lines or the presence of a Balmer break due to a mature stellar population. Accurate redshifts are needed to distinguish between these two hypotheses. One example was confirmed via [O III] emission with ALMA at z=9.11 whose Balmer break indicates the onset of star formation occurred as early as z~15±2. We propose to follow up the only further similar z~9 candidate accessible with ALMA to determine if this initial result is a representative indicator of when galaxies first emerged from the Dark Ages.

Background

Problem

Objective

Strategy

Significance

https://almascience.eso.org/euarcdata/itrain13/HowToWriteReview_ITRAIN.pdf

Abstract considerations

- It should be enough to understand **what, how,** and **why** you want to observe with an abstract alone
- It is the **first impression** that often sets the mood with which the reviewer will read the proposal
- Convey: **excitement, urgency, clarity**

The main components of the proposal

1. Abstract
2. **Scientific Justification**
3. Observing Tool setup and Technical Justification

Scientific justficiation: recommended structure

1. Introduction (~1 page)
   - big picture
   - identifies the problem, open question
   - key references
   - summary of the proposed solution to the problem

Overall:
~ 2 pages of text
~ 2 pages of figures/tables

2. Methodology (~2.5 pages)
   - What will be observed? Target(s) description/sample selection
   - What specific data (lines/continuum/polarization) is required and why
   - What analysis techniques will be used (models/simulations), and what is the path to science?
   - What is the plan for interpretation and the expected impact? Significance of non-detections.

3. Description of observations (~0.5 pages)
   - Essential points only, extensive description can be left for Technical Justification

Know your audience

1. Unless it’s a Large Program, your reviewers are your peers,
   with similar expertise (but not often in the exact same area of research).

2. Try to put yourself in a reviewer's shoes as often as possible
   - *Would I understand this if I wasn’t the expert?*
   - *And if I had 30 proposals to read, would I care about this specific science case?*
   - *If this wasn’t my favourite target, would I care?*

3. Ask your trusted colleagues and research group to read your proposal

Introduction in short

- **Motivation**
  - *Why do we care?*
- **Specific problem**
  - *What is the specific question you are trying to answer*
- **Context**
  - *Why couldn't previous works solve the problem?*
- **Objectives**
  - *What do we measure? What are we trying to detect?*
- **Strategy**
  - *How are you going about achieving your goal?*

Convey excitement!
If by the end of page 1 the reviewer is not excited about the idea, you will not get a good rank!

Target justification

- What is the best target to achieve the science goal?
- If the goal is **to resolve something,** it should probably be a close target!
- If the goal is to **detect** something faint, it should be the brightest target that can get you a detection
- If the target is one-of-a-kind, make sure to mention that, but have a specific question to address.s

My take:

If the proposal is written in a way: this is a cool source, so we need more data on this; you will not get a good rank.

Don’t expose yourself to easy shot-down points:

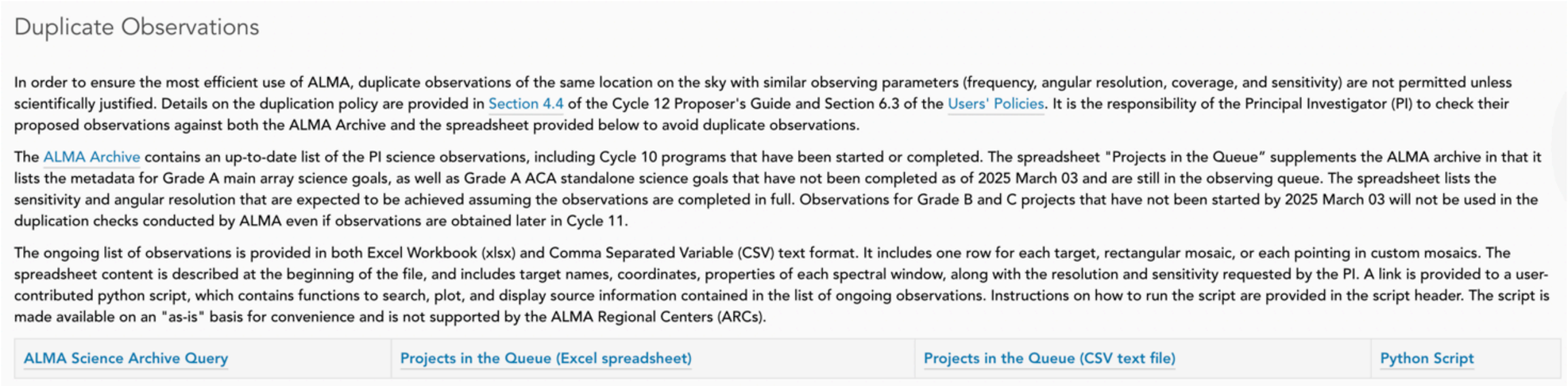
- If you require high resolution, could it be done at a lower resolution using a closer target?
- If you ask for three targets, could the same science be done with two or one?
- If you ask for mosaic pointings, are all of them equally necessary?

Target justification - survey considerations

- **Clear criteria:**
  - *all protostars in a cloud*
  - *all targets brighter than xx mJy*
- **Emphasize quantified improvement**
  - *Tripling the sample size*
  - *Getting certain physical property down to 10% accuracy*

Duplications - have my target been observed already?

- Matching frequency, angular resolution, coverage, and sensitivity
- Details in Proposer's Guide
- Check the ALMA Archive for projects that have been started and completed
- Check Projects in the Queue as well



Duplicate Observations

In order to ensure the most efficient use of ALMA, duplicate observations of the same location on the sky with similar observing parameters (frequency, angular resolution, coverage, and sensitivity) are not permitted unless scientifically justified. Details on the duplication policy are provided in Section 4.4 of the Cycle 12 Proposer's Guide and Section 6.3 of the Users' Policies. It is the responsibility of the Principal Investigator (PI) to check their proposed observations against both the ALMA Archive and the spreadsheet provided below to avoid duplicate observations.

The ALMA Archive contains an up-to-date list of the PI science observations, including Cycle 10 programs that have been started or completed. The spreadsheet "Projects in the Queue" supplements the ALMA archive in that it lists the metadata for Grade A main array science goals, as well as Grade A ACA standalone science goals that have not been completed as of 2025 March 03 and are still in the observing queue. The spreadsheet lists the sensitivity and angular resolution that are expected to be achieved assuming the observations are completed in full. Observations for Grade B and C projects that have not been started by 2025 March 03 will not be used in the duplication checks conducted by ALMA even if observations are obtained later in Cycle 11.

The ongoing list of observations is provided in both Excel Workbook (xlsx) and Comma Separated Variable (CSV) text format. It includes one row for each target, rectangular mosaic, or each pointing in custom mosaics. The spreadsheet content is described at the beginning of the file, and includes target names, coordinates, properties of each spectral window, along with the resolution and sensitivity requested by the PI. A link is provided to a user-contributed python script, which contains functions to search, plot, and display source information contained in the list of ongoing observations. Instructions on how to run the script are provided in the script header. The script is made available on an "as-is" basis for convenience and is not supported by the ALMA Regional Centers (ARCs).

ALMA Science Archive Query	Projects in the Queue (Excel spreadsheet)	Projects in the Queue (CSV text file)	Python Script

Sensitivity considerations

- **Never aim for < 3 sigma detection**
  - *Usually, 5 is a good start, try to be as pessimistic in your assumptions as possible*
- **Show that you thought through how to achieve detection**
  - *Explain if you plan to bin or stack your data*
- **Non-detection is also a result!**
  - *Discuss why the non-detection will be informative and how?*

Don’t expose yourself to easy shot-down points:

- Did you take into account all possible reasons why the signal might be fainter than you expect?
- Did you discuss implications of the non-detection?

Figures and other stylistic points

- Make obvious what is their purpose in the caption
- Simple, clear, easy to read, no tiny labels
- My recommendation is to mix figures with text. Nothing more discouraging than a wall of text.
- **Boldface**, underlines, *cursive*, boxes can be helpful, **but don't overdo it,** otherwise they are not serving the purpose.

*Because not every single sentence requires a **highlight***

Figures is what your reviewers will use to quickly recall what was the proposal about.

References

- Essential and diverse references show you have done your research on the topics, and your question is relevant not only to you but to the larger community
- It might be tempting to save space by using numbers instead of names in the referencing style (Tychoniec et al. 2026), but usually this makes the proposal more difficult to read [1].
- It should not be necessary to go to references to understand your proposal.

[1] - Tychoniec et al. 2026

The main components of the proposal

1. Abstract

2. Scientific Justification

3. **Observing Tool setup and Technical Justification**
   -> Talk by Katharina Immer

In the scientific justification: keep the essentials

- Why this line (H36α)?: The intrinsic line flux of a certain submm-RL under some atmospheric condition is not straightforward to predict, which is a risk for highest resolution observations. In this regard, H36α is a reasonable choice as we already know the line flux (Fig.2). In addition, this line falls to the good atmospheric window (Band 4), which is ideal for long baseline observations.
- Why this spatial resolution ($0''.036$)?: With this highest resolution achievable for H36α, we can resolve the line-emitting region into 3–4 spatial elements along the north-west direction ($\sim 2-2.5$ pc extent; Fig.2a). Hence we can assess detailed internal spatial and velocity structures.
- Why this dV (75 km s^{-1})?: This is the same value as we adopted to extract the line spectrum in Fig.2b, which ensures that this dV works well as the line is quite broad.
- Why this depth (87 μJy beam^{-1})?: We will detect the expected line emission within the beam at sufficiently high S/N to model the profile. See details in the following.

https://www2.nao.ac.jp/~eaarc/Meetings/ALMA_PPM2024/files/PPM_Cycle11_tips_TI.pdf

From the guidelines: what the reviewers are looking for?

1. **Scientific Merit**
   - Does the proposal clearly indicate which important, outstanding questions will be addressed?
   - Will the proposed observations have a high scientific impact on this particular field and address the specific science goals of the proposal?

Note: ALMA encourages reviewers to consider well-designed high-risk/high-impact proposals even if there is no guarantee of a positive outcome or detection.

   - Does the proposal clearly describe how the data will be analyzed in order to achieve the science goals?

From the guidelines: what the reviewers are looking for?

2. Suitability of Observations

- Is the choice of target (or targets) clearly described and well justified?
- Are the requested signal-to-noise ratio, angular resolution, largest angular scale, and spectral setup sufficient to achieve the science goals well justified?
- Does the proposal justify why new observations are needed to achieve the science goals?
- For Joint Proposals (see the Proposer's Guide), does the proposal clearly describe why observations from multiple observatories are required to achieve the science goals?

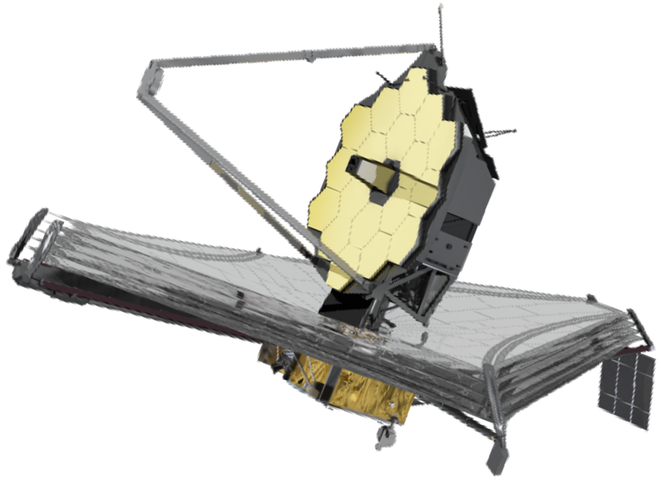
Important: Base your assessment solely on the content of the proposal according to the above criteria. Proposals may contain references to published papers (including preprints) as per standard practice in scientific literature. Consultation of those references should not, however, be required for a general understanding of the proposal.

Large Programs

- Longer proposal (7 pages)
- Team expertise to be submitted separately
- The Scientific Justification for Large Programs must include additional information:
  - scheduling feasibility
  - data reduction plan and computing resources
  - data products
  - publication plan

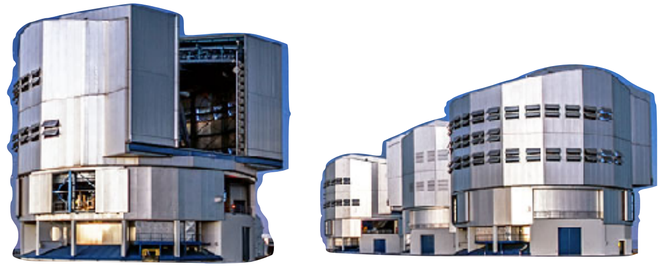
Joint Programs

JWST



115 hours

VLT



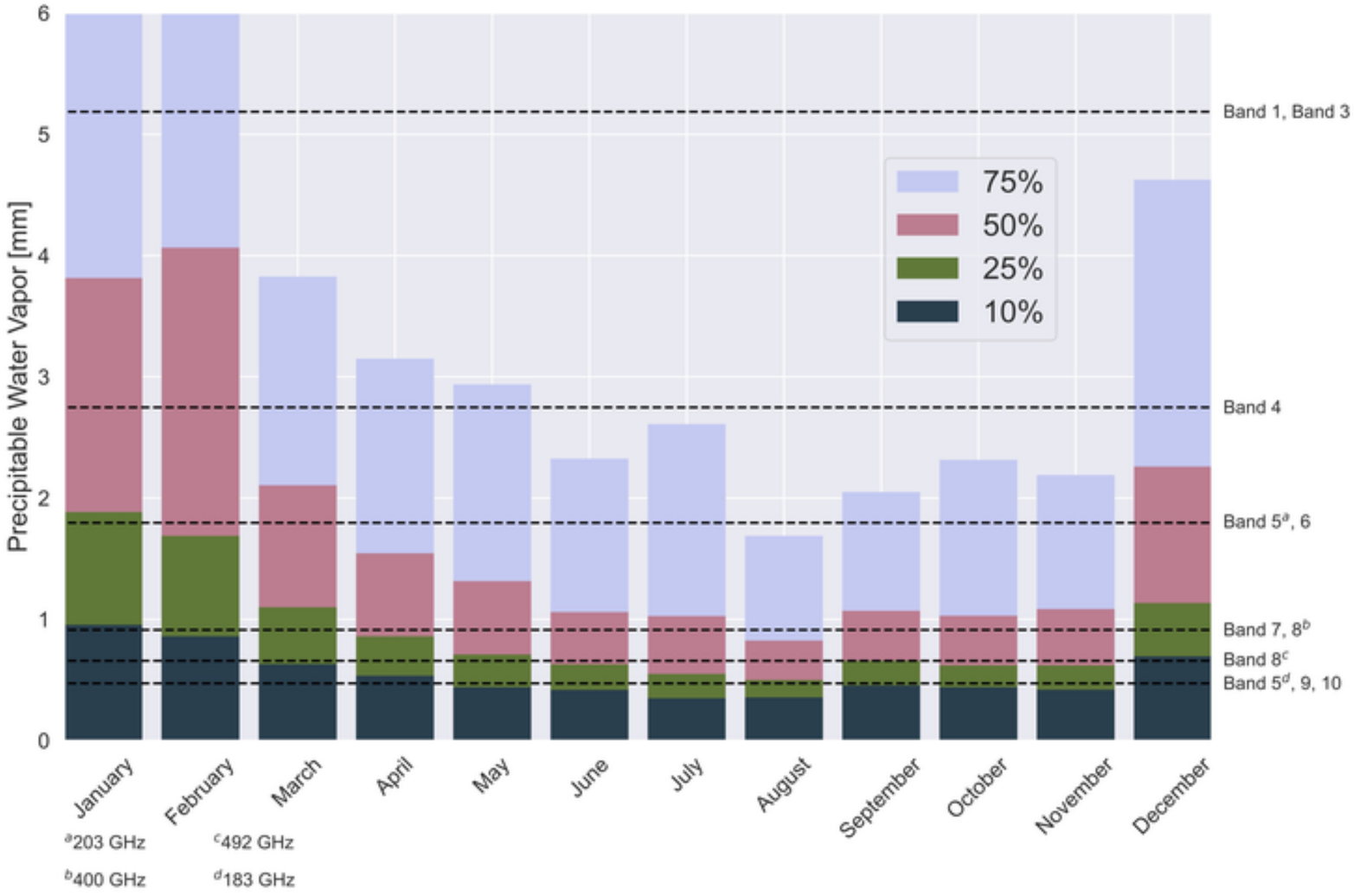
50 hours

VLA

5% of total

Agreement for Joint Proposals since Cycle 10

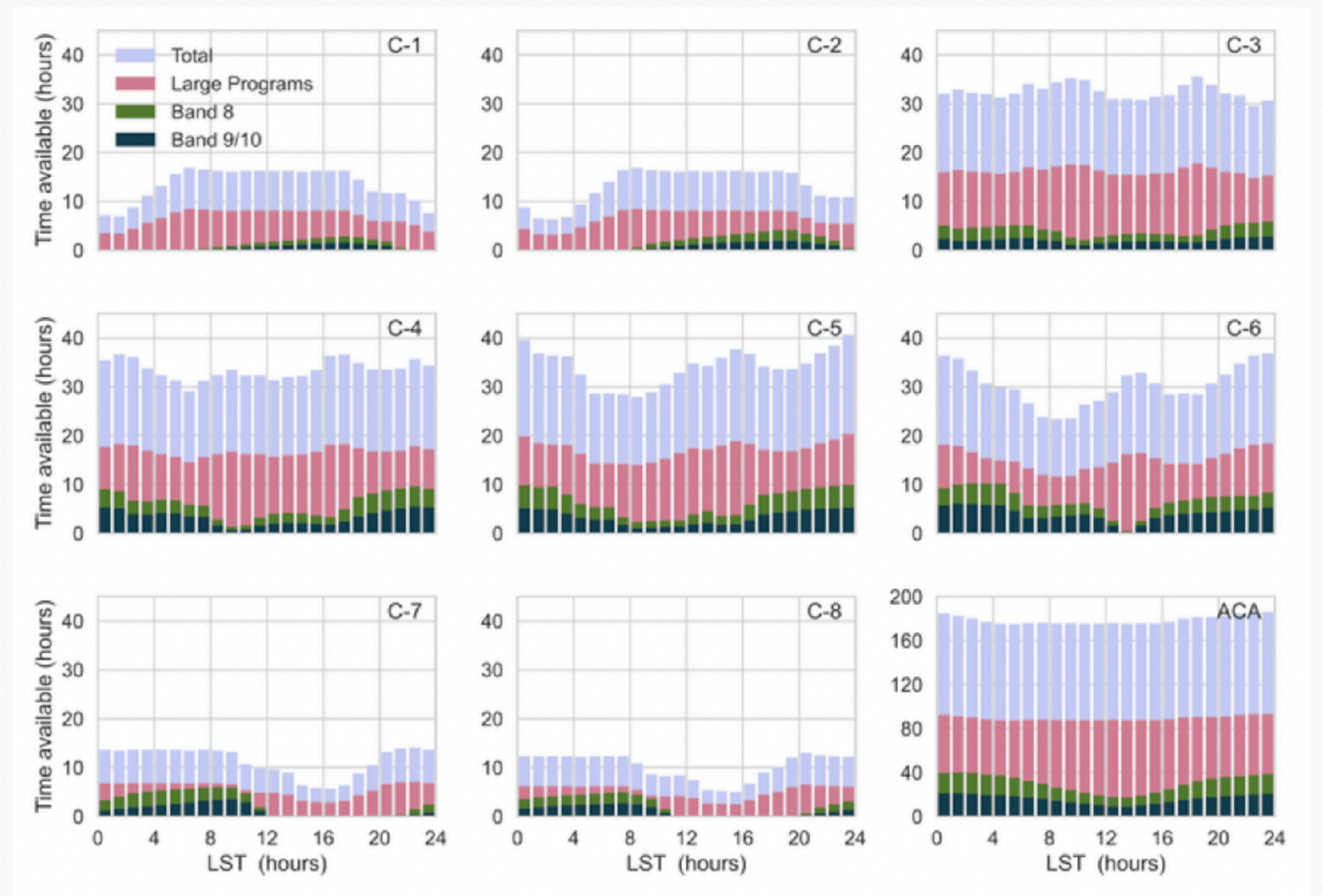
Special considerations - weather



Special considerations - configuration schedule

Start date	Configuration	Longest baseline	LST for best observing conditions
2025 October 1	C-8	8.5 km	~ 22—10 h
2025 October 20	C-7	3.6 km	~ 23—11 h
2025 November 10	C-6	2.5 km	~ 1—13 h
2025 December 1	C-5	1.4 km	~ 2—14 h
2025 December 20	C-4	0.78 km	~ 4—15 h
2026 January 10	C-3	0.50 km	~ 5—17 h
2026 February 1	*No observations due to maintenance*		
2026 March 1	C-1	0.16 km	~ 8—21 h
2026 March 26	C-2	0.31 km	~ 9—23 h
2026 April 20	C-3	0.50 km	~ 11—0 h
2026 May 10	C-4	0.78 km	~ 12—2 h
2026 May 31	C-5	1.4 km	~ 13—4 h
2026 June 23	C-6	2.5 km	~ 15—6 h
2026 July 28	C-5	1.4 km	~ 17—7 h
2026 August 18	C-4	0.78 km	~ 19—8 h
2026 September 10	C-3	0.50 km	~ 20—9 h

Special considerations - LST availability per configuration



How does it work in practice

- What resolution (and largest angular scales) is needed for my science case?
  This determines the ALMA configurations you need.

- When are the configurations scheduled, and what are the LST ranges?
  This determines when your source can be observed at a given resolution.

  Yes, it is possible that your desired configuration is not optimal for given sources in this Cycle, so multi-cycle planning is sometimes required!

Where to find information

1. Call for Proposals and Proposers Guide

https://almascience.eso.org/proposing/proposers-guide

2. ALMA Primer

https://almascience.eso.org/documents-and-tools/cycle12/alma-science-primer

3. ALMA Techincal Handbook

https://almascience.eso.org/documents-and-tools/cycle12/alma-technical-handbook

4. ALMA User Policies

https://almascience.eso.org/documents-and-tools/cycle12/alma-user-policies

5. I-TRAIN lectures

https://almascience.eso.org/tools/eu-arc-network/i-train

6. Helpdesk Knowledgebase

https://help.almascience.org/kb

Did not find an answer?
Write a ticket / contact your ARC Node

Sensitivity calculator

Sensitivity Calculator

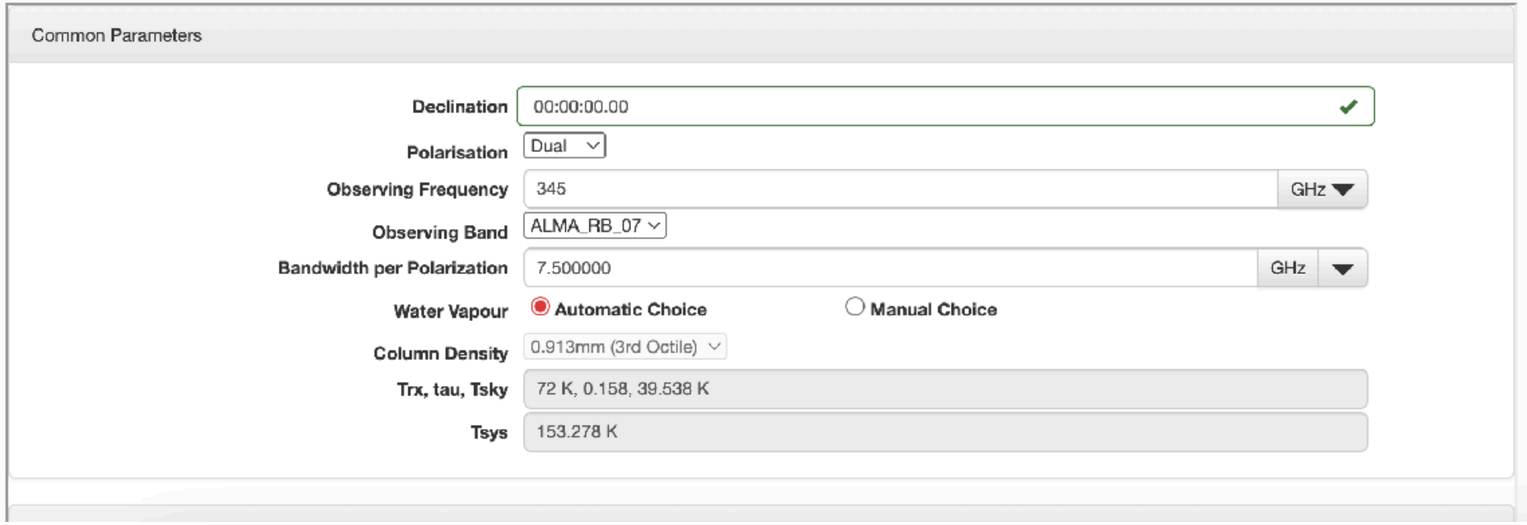
The ALMA Sensitivity Calculator (ASC) will calculate the necessary integration times for a given sensitivity (or vice versa) for your ALMA observing project. Input and output parameters are explained below, but for an in-depth explanation of how the ASC works, please consult Chapter 9 of the ALMA Technical Handbook.

The ASC has been configured so that inputs are allowed that conform to the final design specification of ALMA e.g. the maximum number of allowed antennas for the 12-m array is 50 and the highest resolution must not exceed that corresponding to a maximum baseline of 16 km. This allows users to prepare for future Cycles.

Please be aware of the following limitations:

- Integration times refer only to the on-source time (no overheads are taken into account)
- For DSB receivers (B9 and 10) the contribution to the system temperature from the image sideband is assumed to be twice that in the signal sideband
- The ASC is not able to add the source contribution to the system temperature and therefore the times for particularly bright sources e.g. planets or the Sun, will be underestimated
- The effects of shadowing are not taken into account

In order for the ASC to work, your browser must have JavaScript enabled.



Do

- **Make the reviewer's job easy:** highlight key points, write a good abstract, and provide useful figures
- Make your proposal **memorable** and **exciting**. The goal is to get the reviewer excited about your idea, even if this is not their immediate field of expertise.
- Take into account feedback from previous cycles, but remember that it will be read by different group of experts
- Proofread your proposal several times
- Send it to the co-Investigator in advance; everybody likely has their own proposals

Don’t

- Reduce the font size or adjust margins of the template
- Reveal your or your co-I’s identities
- Set range of resolution and plan to narrow it down later on
- Be vague: “improve our understanding”, “help to constrain models”
- Oversell your proposal: “holy grail”, “rosetta stone” are rarely applicable and they raise doubts

Use of Generative AI

Proposal preparation: Investigators may use GAI to assist with proposal preparation tasks, such as refining and organizing text. Investigators are fully responsible for:

- Ensuring that any content produced with GAI is scientifically accurate, original, and free from plagiarism.
- Properly citing all original source material referenced in content created using GAI, in accordance with academic standards.

My advice:

- Ask AI to generate your citations. In most cases, it is hallucinating, and a few things trigger reviewers more than a made-up citation. But if you do it, then you probably deserve a 10 anyway (priv. comm.)

https://almascience.eso.org/documents-and-tools/cycle12/alma-user-policies

Reviewing ALMA proposal

- For each submitted proposal (except Large Program) you will have to review 10 proposals, if you want your proposal to be considered
- If you don’t have a PhD, you will need a mentor
- Just treat other proposals like you would like your proposal to be treated: be professional, read it carefully, allocate enough time in advance, provide constructive feedback, focus on the proposal not on the proposers, don’t try to guess proposer’s identity.

Reviewing ALMA proposal

- Summary not necessary but it gives PI some confidence you understood the proposal and didn't for example mixed it with other proposal in the pool (which is sometimes a suspicion)
- List strenghts, what did you like about the proposal
- List weaknesses, with suggestions for improvements
- Don't try to find flaws in proposal, it's fine to state:
  No weaknesses, but others were slightly more compelling

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  No weaknesses, but others were slightly more compelling
- Pay attention to the grading: **1 is the best and 10 is the worst**

Reviewing ALMA proposal

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