How to Write a Good ALMA Proposal

Practical Tips for a Successful Submission

Zhengyi Chen (National Astronomical Observatory of Japan)

ALMA Cycle 12 Proposal Preparation Meeting @ Mitaka/NAOJ March 21, 2025

Reference materials 参考資料

"ALMA Cycle 12 Proposal Preparation Meeting" Webpage

(Click on the underlined items to access the webpage)

1. Previous Preparation Meeting

- Cycle 10: "Tips for writing ALMA proposal (John Carpenter/Bunyo Hatsukade-san)"
- Cycle 11: "Show Cases of Successful Proposal: general points (Takuma Izumi-san)"

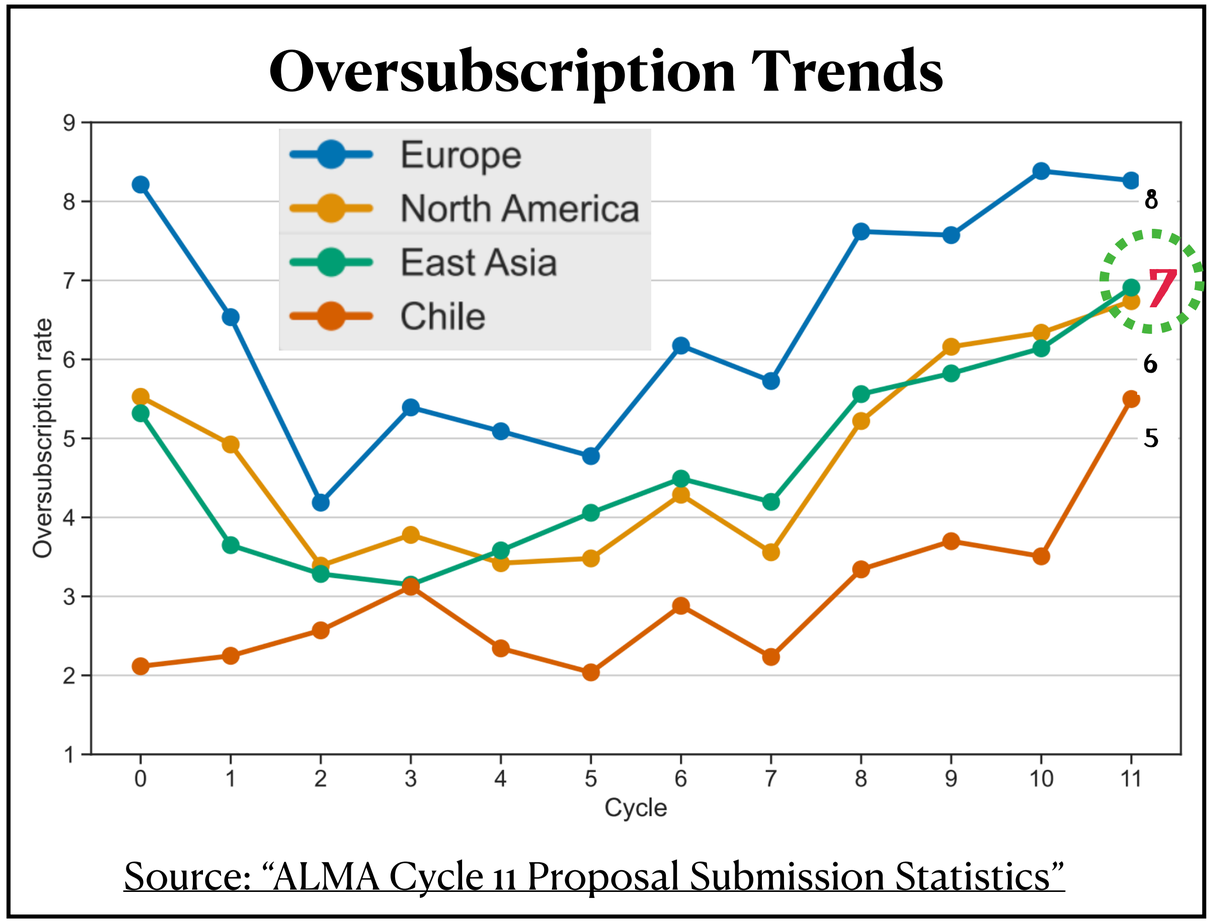
2. I-TRAIN with European ARC Network (I-TRAIN#13; Cycle 10 training)

- Training video
- Presentation
  - How to Write & Review ALMA proposals
  - Dual-Anonymous Guidelines Quiz Answers

3. ALMA Documents (Cycle 12)

Screenshot of partial documents

Why A Well-Written Proposal is important?



Source: "ALMA Cycle 11 Proposal Submission Statistics"

Hatsukade-san's talk

- ALMA is highly competitive (~10-20%)
- A well-structured and clearly written proposal improves your chances of being selected.

Outlines

1. Scientific Justification
2. OT: Abstract & Technical Justification
3. Cycle 12 Updates, Policies and others

1. Scientific Justification

Scientific Justification Requirements
(Ref. ALMA Proposer's Guide - Section 5.3.1)

1. PDF format (A4/US Letter; ≥ 12pt font)
   - ALMA OT rejects proposals if >15% of text is too small
2. Page Limitations
   - Regular: 4-page
   - Large Program: 7-page (6-page science + 1 anonymised management plan) + a separate non-anonymised Team Expertise
3. Proposal must be self-contained
   - References (including arXiv) allowed, but should not be required for understanding

Scientific Justification Requirements
(Ref. ALMA Proposer's Guide - Section 5.3.1)

1. PDF format (A4/US Letter; ≥ 12pt font)

   - ALMA OT rejects proposals if >15% of text is too small

Page layout and font sizes:

Details

- Page format: A4 or US Letter.
- Text area: No larger than 247 mm by 180 mm.
  - For A4 paper this corresponds to top/bottom margins of 25 mm and left/right margins of 15 mm.
  - For US letter paper this corresponds to top/bottom margins of 16 mm (0.62 inches) and left/right margins of 18 mm (0.71 inches).
- Font size: Minimum 12 points, including the main text, figure captions, tables, and references.
- Line spacing: single line spacing (14.4 points) for all content.

The official template is recommended due to strict format control in this cycle.

Recommended Proposal Structure

1. Introduction (1 page):
   - big picture
   - specific problem to be solved
   - previous work and unsolved issues
   - brief summary of what you propose to do
2. Methodology (2.5 pages):
   - observe what & why
   - what data needed
   - analytic techniques
   - plan for interpreting the results and expected impact
3. Description of observations (0.5 pages)

~2 pages text

+

~2 pages figure/table

In One Sentence: the key is to **convince reviewers** that your research question is **compelling**, your proposed observations are **feasible**, and you have the **expertise** to effectively analyse the data and address the scientific objectives.

Key Elements of a Strong Scientific Justification

1. [Introduction] Clear and Structured Science Case

- **Define a well-motivated research question:** big picture - specific problem to be solved - previous work and unsolved issues - brief summary of what you propose to do
- **Justify why ALMA is essential:** demonstrate that your research cannot be achieved with other facilities or existing archival data.

2. [Methodology] Well selected source(s)/sample(s)

- **Strong justification for selected source(s)/sample(s):** Ensure alignment with research objectives and requested ALMA observations
- **Prioritise relevance and clarity and support the description with figure(s)/table(s) if possible:** due to page limits, focus on the most convincing and essential details

3. [Technical Justification] Understanding Technical Constraints - Realistic & Feasible

- **Ensure the proposed observations are realistic:** ang. resolution, sensitivity, spectral setup, etc

4. Concise and Effective Writing

- **Avoid unnecessary details or vague statements:** You know your project well and have many details, but a strong proposal is about convincing the reviewer. With limited space, focus on the most compelling arguments—be clear, not exhaustive.
- **Leverage multi-format content (figures, tables) to enhance clarity**

Key Elements of a Strong Scientific Justification

1. [Introduction] Clear and Structured Science Case

- Define a well-motivated research question: big picture - specific problem to be solved - previous work and unsolved issues - brief summary of what you propose to do
- Justify why ALMA is essential: demonstrate that your research cannot be achieved with other facilities or existing archival data.

2. [Methodology] Well selected source(s)/sample(s)

- Strong justification for selected source(s)/sample(s): Ensure alignment with research objectives and requested ALMA observations
- Prioritise relevance and clarity and support the description with figure(s)/table(s) if possible: due to page limits, focus on the most convincing and essential details

3. [Technical Justification] Understanding Technical Constraints - Realistic & Feasible

- Ensure the proposed observations are realistic: ang. resolution, sensitivity, spectral setup, etc

4. Concise and Effective Writing

- Avoid unnecessary details or vague statements: You know your project well and have many details, but a strong proposal is about convincing the reviewer. With limited space, focus on the most compelling arguments—be clear, not exhaustive.
- Leverage multi-format content (figures, tables) to enhance clarity

Key Elements of a Strong Scientific Justification

1. [Introduction] Clear and Structured Science Case

- **Define a well-motivated research question:** big picture - specific problem to be solved - previous work and unsolved issues - brief summary of what you propose to do
- **Justify why ALMA is essential:** demonstrate that your research cannot be achieved with other facilities or existing archival data.

2. [Methodology] Well selected source(s)/sample(s)

- **Strong justification for selected source(s)/sample(s):** Ensure alignment with research objectives and requested ALMA observations
- **Prioritise relevance and clarity and support the description with figure(s)/table(s) if possible:** due to page limits, focus on the most convincing and essential details

3. [Technical Justification] Understanding Technical Constraints - Realistic & Feasible

- **Ensure the proposed observations are realistic:** ang. resolution, sensitivity, spectral setup, etc

4. Concise and Effective Writing

- **Avoid unnecessary details or vague statements:** You know your project well and have many details, but a strong proposal is about convincing the reviewer. With limited space, focus on the most compelling arguments—be clear, not exhaustive.
- **Leverage multi-format content (figures, tables) to enhance clarity**

Key Elements of a Strong Scientific Justification

1. [Introduction] Clear and Structured Science Case

- **Define a well-motivated research question:** big picture - specific problem to be solved - previous work and unsolved issues - brief summary of what you propose to do
- **Justify why ALMA is essential:** demonstrate that your research cannot be achieved with other facilities or existing archival data.

2. [Methodology] Well selected source(s)/sample(s)

- **Strong justification for selected source(s)/sample(s):** Ensure alignment with research objectives and requested ALMA observations
- **Prioritise relevance and clarity and support the description with figure(s)/table(s) if possible:** due to page limits, focus on the most convincing and essential details

3. [Technical Justification] Understanding Technical Constraints - Realistic & Feasible

- **Ensure the proposed observations are realistic:** ang. resolution, sensitivity, spectral setup, etc

4. Concise and Effective Writing

- **Avoid unnecessary details or vague statements:** You know your project well and have many details, but a strong proposal is about convincing the reviewer. With limited space, focus on the most compelling arguments—be clear, not exhaustive.
- **Leverage multi-format content (figures, tables) to enhance clarity**

Key Elements of a Strong Scientific Justification

1. [Introduction] Clear and Structured Science Case

- **Define a well-motivated research question:** big picture - specific problem to be solved - previous work and unsolved issues - brief summary of what you propose to do
- **Justify why ALMA is essential:** demonstrate that your research cannot be achieved with other facilities or existing archival data.

2. [Methodology] Well selected source(s)/sample(s)

- **Strong justification for selected source(s)/sample(s):** Ensure alignment with research objectives and requested ALMA observations
- **Prioritise relevance and clarity and support the description with figure(s)/table(s) if possible:** due to page limits, focus on the most convincing and essential details

3. [Technical Justification] Understanding Technical Constraints - Realistic & Feasible

- **Ensure the proposed observations are realistic:** ang. resolution, sensitivity, spectral setup, etc

4. Concise and Effective Writing

- **Avoid unnecessary details or vague statements:** You know your project well and have many details, but a strong proposal is about convincing the reviewer. With limited space, focus on the most compelling arguments—be clear, not exhaustive.
- **Leverage multi-format content (figures, tables) to enhance clarity**

2. OT Filling

OT Filling: Abstract (1200 characters)

1. Writing a good abstract is essential
   - The abstract is your proposal’s first impression on the reviewer — a weak abstract can undermine your entire proposal.
2. Abstract is NOT repetition or partially duplication
   - Avoid repeating content from the Scientific Justification, and do not duplicate the abstract within it.
3. Key Components of an Abstract
   - Scientific Motivation & Context
   - Specific Goals & Hypothesis
   - Observational Strategy & Justification
   - Expected Outcomes & Impact

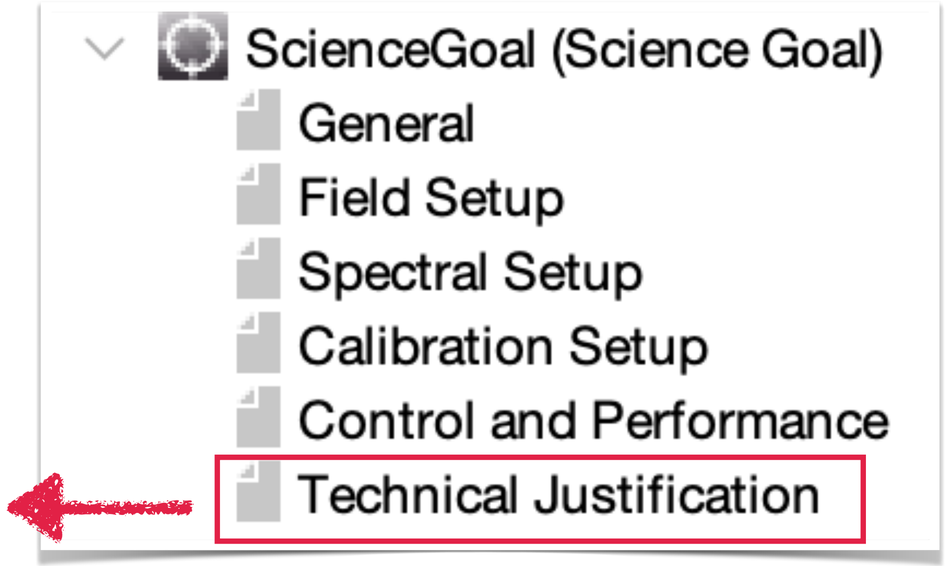
OT Filling: Technical Justification

1. Items in Technical Justification

(1) Bandwidth Justification for Sensitivity Calculation

(2) Angular Resolution & Largest Angular Scale Justification

(3) Correlator Setup Justification



2. Key of good technical justification

Quantitatively Justify why the designed setup are necessary for achieving your objectives.

(others will be covered in Gianni Cataldi's upcoming afternoon talk)

Examples

2. Technical Justifications — (1) Bandwidth Justification for Sensitivity Calculation

- Balance between spectral resolution and sensitivity
- Use quantitative reasoning: ensure enough S/N while preserving line structure.
- Example:
  - *For our **[Target Line]** line observation at **[Frequency]** GHz, we use a spectral resolution of **[Velocity Width]** km/s, which corresponding to a channel width of **[Bandwidth]** MHz. To ensure an optimal balance between sensitivity and spectral resolution, we set the channel bandwidth to **[Chosen Bandwidth]** MHz. This setup provides an expected RMS noise level of **[RMS]** mJy/beam in a [Integration Time] minutes per beam. This ensure a **[S/N Ratio]**σ detection of line flux of **[Line Flux]** mJy/beam, which is a typical for **[Type of Target]** emitters in our sample.*
  - ([XXX] placeholders represent quantitative values that should be calculated based on the science case.)

Examples

2. Technical Justifications — (2) Angular Resolution & Largest Angular Scale Justifications

- Sufficient spatial resolution to resolve structures
- Largest Angular Scale to avoid missing flux
- Example:
  - *For our **[Target Source]** at **[Frequency]** GHz, we select an angular resolution of **[Angular Resolution]**, corresponding to **[Physical Scale]** pc at **[Distance]** Mac, to resolve key structures like **[Example: star-forming regions]** while maintaining sensitivity. To prevent flux loss, we set the Largest Angular Structure in Source to **[Largest Angular Scale]**, sufficient to cover **[Total Target Structure Size]**, as supported by **[Previous Evidence]**. A miner resolution would dilute S/N, while a coarser one would blend structures.*
  - ([XXX] placeholders represent quantitative values that should be calculated based on the science case.)

Examples

2. Technical Justifications — (3) Correlator Setup Justification

- Optimise spectral resolution and sensitivity
- Ensure sufficient velocity coverage for the target science case
- Justify spectral binning, number of spectral windows, and velocity resolution.
- Example:
  - *For our **[Target Line]** observations at **[Frequency]** GHz, the expected line width is **[Line Width]** km/s, based on **[Previous Observations/Simulations]**. To adequately sample velocity structures, we select a spectral resolution of **[Chosen Resolution]** km/s, corresponding to **[Number of Channels]** spectral elements per FWHM. To optimise data storage while preserving kinematics, we apply **[Spectral Averaging]**, reducing the resolution to **[Average Resolution]** km/s, which remains sufficient to resolve velocity gradients in **[Science Target]**. This setup ensures that our spectral windows provide the necessary velocity coverage of **[Velocity Coverage]** km/s to detect **[Target Line]** across the entire observed field.*
  - ([XXX] placeholders represent quantitative values that should be calculated based on the science case.)

3. Updates, Policies, and Others

What is New in Cycle 12

Considering the NEW features of Cycle 12 to assist your proposal planning.

- Webpage "Announce for early proposal planning for Cycle 12": https://almascience.nao.ac.jp/news/announcement-for-early-proposal-planning-for-cycle-12

Taniguchi-san's talk

New in Cycle 12

- Full-polarization single-field interferometry in Band 1 on the 7-m Array with the same polarization capability and accuracy as in Bands 3 - 7
- VLBI flux density thresholds for active phasing targets can be reduced by sqrt(8) across all bands compared with the limits imposed for Cycle 11.
- In addition to the regular ALMA EHT campaign, EHT multi-epoch monitoring will allow proposals spanning March through May . Monitoring observations will be limited to ALMA night time LSTs. Proposals are still limited to less than 50 hours.

2. ALMA policy — Dual-anonymous peer review

1. Purpose of Dual-Anonymous Review

1. Ensure fair evaluation based only on scientific merit
2. Reviewers do not know the identity of proposers, and vice versa

2. Key Guidelines for Anonymous Writing

1. DO NOT include names or affiliations
   - special case: do not list the name of the person when referencing "private communications"
2. Use third-person phrasing or neutral wording
   - ❌ "We observed X." → ✅ "X was observed"
   - ❌ "Our previous work (Smith et al. 2020) found..." → ✅ "Smith et al. (2020) found..."
   - More examples can be found in the ALMA Dual-Anonymous Guidelines.
3. Do NOT include acknowledgments (to avoid revealing collaborations).

3. Consequence of Violations

1. Proposals may be rejected or score lower if they violate anonymity.
2. Reviewers are instructed to reported violations; Proposal Handling Team (PHT) would follow up

Refer to the ALMA Cycle 12 Proposer's Guide - Section 5.2 & Dual Anonymous Guidelines for complete guidelines.

3. Peer Review Comments from Previous Cycles

Addressing Peer Review Comments (for Resubmissions)

- If you are resubmitting a proposal, make sure to **carefully review and address** peer review comments from previous cycles.
- As highlighted in Andrea Corvillon's talk, **peer review comments come from fellow proposers who are required to carefully evaluate proposals under the two-stage review process** — their feedback deserves respect and **might help improve** your proposal.
- Pay special attention to **"improvement-request" comments raised by multiple reviewers**. These reflect common concerns and might reappear if not properly addressed, potentially affecting your ranking.

Thank you!

Comments? Others?