How to Write a Successful ALMA Proposal

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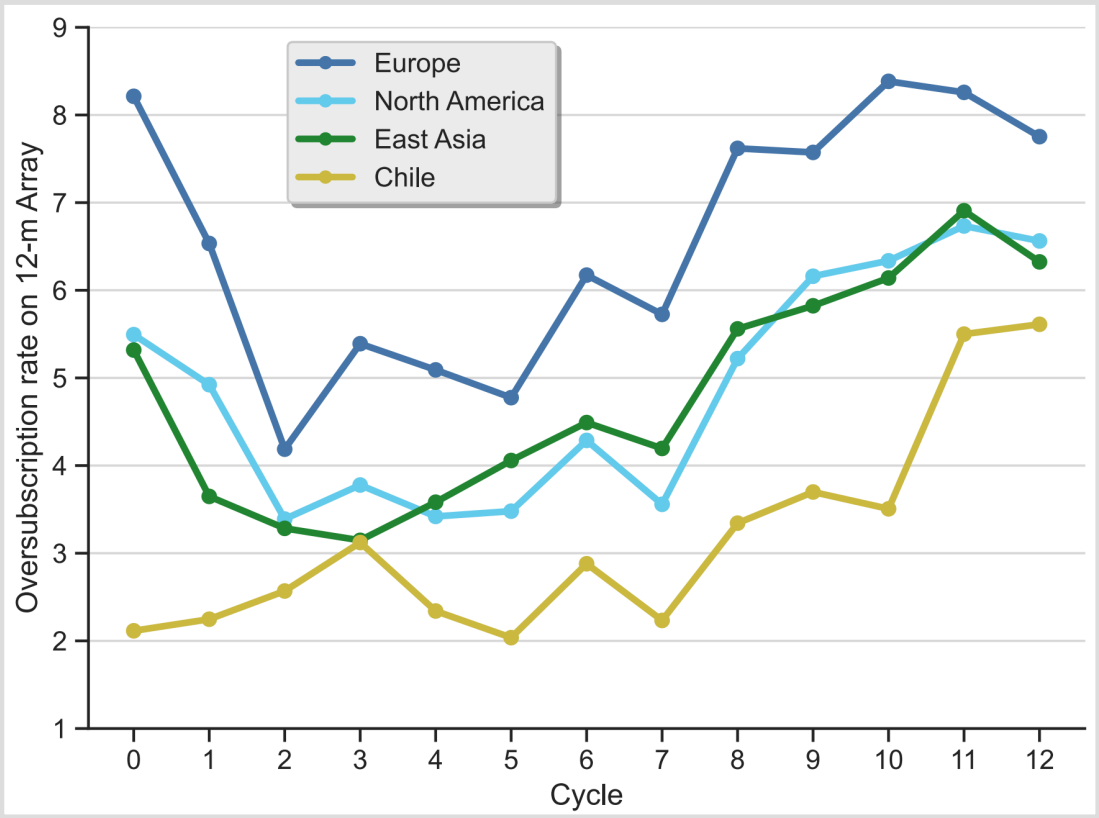
Reference Materials 参考資料

- 『ALMA Cycle 13 Proposal Preparation Meeting』website
- 『ALMA Cycle 13 Documents』

Document	
ALMA Proposer's Guide	Kawamura-san's Talk
ALMA Technical Handbook	Pei-Ying Hsieh's Talk
ALMA Users' Policies	
Observing With ALMA – A Primer	
ALMA Proposal Template	
ALMA Proposal Review Process	
Principles of the ALMA Proposal Review Process	Andrea Colvin's Talk
OT User Manual	Gianni Cataldi's Talk
…	

Why A Well-Written Proposal Important



- ALMA acceptance rate: **~ 1 in 6-7**
- Reviewers read **many proposals in limited time**
- If your idea is not:
  - Clear
  - Structured
  - Easy to follow

→ it will be **missed or undervalued**

Hatsukade-san's Talk

Outline

1. **Scientific Justification (PDF) ①**
   - Requirements: format, page limitation, and others
   - Recommended Proposal Structure
   - Key Elements of a Strong Scientific Justification
2. **Abstract & Technical Justification (OT)**
   - Abstract ②
   - Technical Justification ③
3. **Cycle 13 Updates, Policies and Others**

1. Scientific Justification (PDF Document)

Scientific Justification — Requirements Highlight

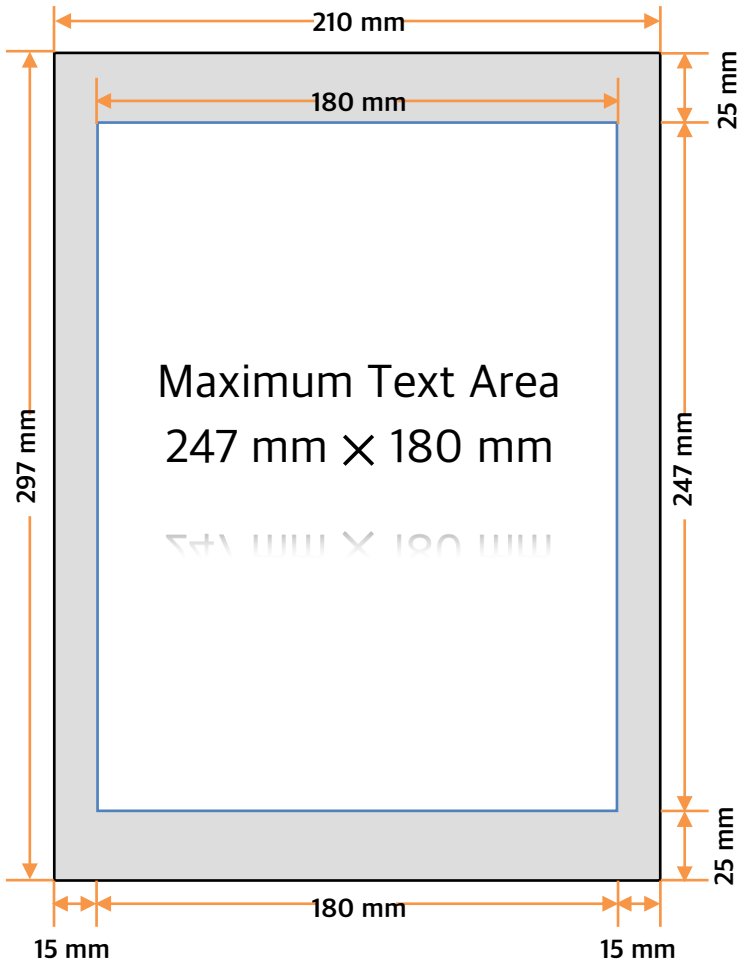
The official template is strongly recommended, as Cycle 12 introduced stricter and more detailed format requirements (compared to Cycle 11), which are maintained in Cycle 13.

1. **Page Layout and font sizes**
   - 20 MB size limited PDF document; page format: A4 / US Letter
   - Font size: ≥ 12 pt font (incl. Figure, Table, References); ALMA OT rejects proposal if > 15% of text is too small
   - Text area: No larger than 247 mm by 180 mm; symmetrical margins
   - Line Spacing: single line spacing (14.4 points) for all content
2. **Page Limitations**
   - Regular Program: 4-page
   - Large Program: 7-page (Ref. ALMA Proposer's Guide - Section 5.5)
3. **Science case**
   - Proposal Must be Self-contained

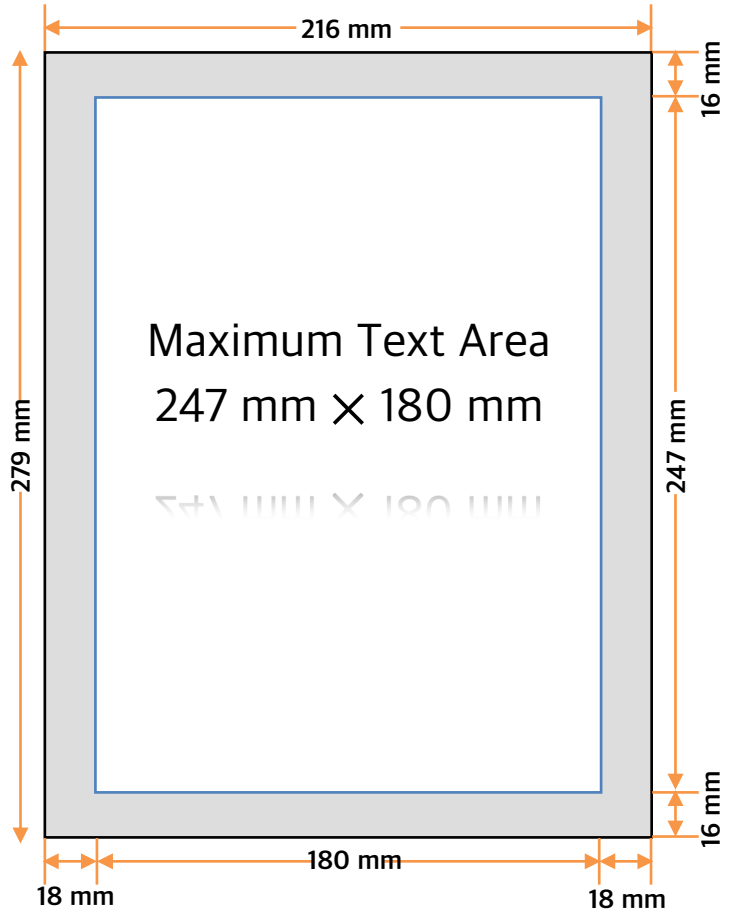
(Ref.: ALMA Proposer's Guide - Section 5.3)

Page Layout Illustration（ページレイアウト仕様）

A4



US Letter



The official template is strongly recommended.

Recommended Proposal Structure

1. **Introduction (~ 1 page)**
   - Big picture
   - Key scientific question
   - Previous work and unresolved issues
   - What you propose to do

2. **Methodology (~ 2.5 pages)**
   - What to observe and why
   - What data needed
   - Analytic method / techniques
   - How results will be interpreted and linked to science goals

3. **Description of Observations (~ 0.5 page)**
   - Salient points only; refer to Technical Justification for details

Key Elements of a Strong Scientific Justification

1. **Introduction**: Clear and Structured Science Case
2. **Methodology**: Well Selected Source(s) / Sample(s)
3. **Description of Observations**: Understanding Technical Constraints – Realistic & Feasible
4. **Figures**: Concise and Effective Writing & Figures

Scientific Justification: 1. Introduction

1. **Define a well-motivated research question (formulaic):**
    - Motivation: what is the big picture and why is it important?
    - Specific problem: what problem are you going to solve?
    - Context: Why can't previous work solve the problem?
    - Objectives: we need to measure …
    - Strategy: In this proposal, we will…
2. **Justify why the proposed ALMA observation is essential:**
    - e.g., demonstrate why your research cannot be achieved with other facilities or archival data

★ **First impression matter:** the introduction is as critical as the Abstract. If the first page fails to attract the reviewer, the proposal is likely to be ranked poorly.

Scientific Justification: 2. Methodology

- **What will you observe with ALMA**
  - Present specific goals
  - Describe source(s) / sample(s) to be observed — Avoid unclear term such as “BEST” — Instead, provide specific justification (e.g., “closest”, “brightest”, “unique” with explanation, “rich ancillary data”
  - Provide details of the requested ALMA observations
- **How will you analyse the data?**
  - Describe the analysis techniques / models
  - ALMA/CASA simulations are often useful — simulating different array components and configurations may strengthen the proposal

    (Ref.: ALMA Proposer’s Guide - Section 4.6.2)
- **Expected results and impact**
  - e.g., observe X → prefer model A; observe Y → prefer model B

Scientific Justification: 3. Description of Observations

- Ensure the proposed observations are **realistic**
    - Angular resolution; Sensitivity; Spectral setup, etc.
- Aim for a significant detection (**at least 3σ**, if not higher)
- Address the case of **non-detection**: explain what an upper limit would imply and why it remains scientifically valuable — this helps strengthen the proposal against potential reviewer criticism.
- Main points only; refer to Technical Justification for details

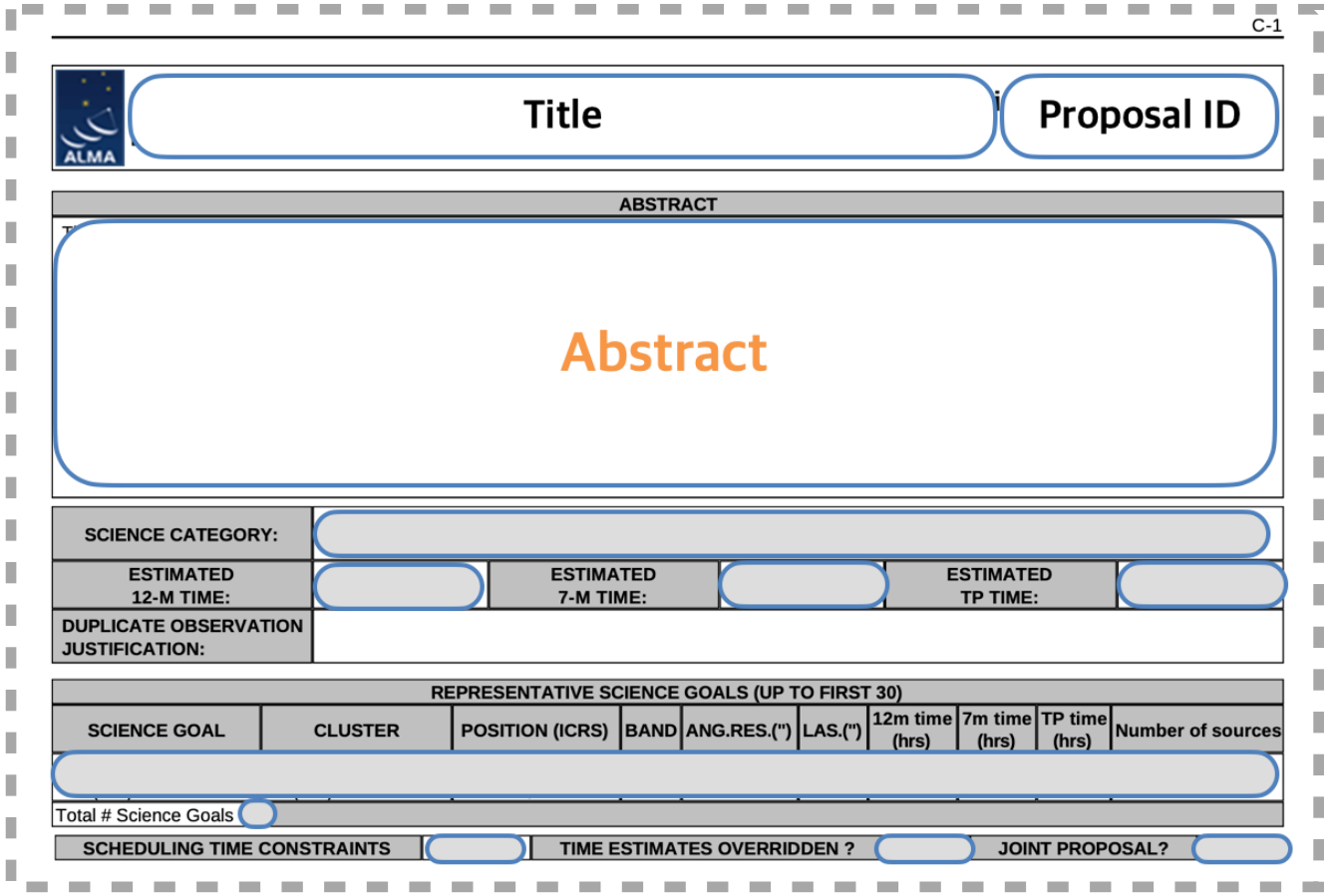
Scientific Justification: 4. Effective Writing, Figures & Tables

- **Avoid unnecessary details or vague statements**
  - Focus on the most compelling arguments — be clear, not exhaustive
- **Use figures and tables to enhance clarity**
  - Figures should be simple and highlight a key point
  - A good figure can replace dense text
- **Make figures self-explanatory**
  - Captions should clearly state the main message
  - Do not assume the reviewer will interpret it
- **Figures and captions should be easily readable**
  - Avoid small fonts and dense layouts ($\geq$ 12pt; single-line spacing)

2. Abstract & Technical Justification (OT Filling)

OT Filling — Abstract: Make a good first impression

Cover sheet layout of the full proposal (with sensitive information masked)


C-1

ALMA | Title | Proposal ID

ABSTRACT

Abstract

SCIENCE CATEGORY:					
ESTIMATED 12-M TIME:		ESTIMATED 7-M TIME:		ESTIMATED TP TIME:	
DUPLICATE OBSERVATION JUSTIFICATION:					

REPRESENTATIVE SCIENCE GOALS (UP TO FIRST 30)

SCIENCE GOAL	CLUSTER	POSITION (ICRS)	BAND	ANG.RES.(")	LAS.(")	12m time (hrs)	7m time (hrs)	TP time (hrs)	Number of sources

Total # Science Goals

SCHEDULING TIME CONSTRAINTS		TIME ESTIMATES OVERRIDDEN ?		JOINT PROPOSAL?	

- The Abstract is on the **front page — immediately below the title**
- It is often the **first scientific content** reviewers read
- **First impression matter:** the Abstract sets the tone for the entire proposal
- If the Abstract is not compelling, the proposal may already be at a disadvantage

OT Filling — Abstract: Make a good first impression

- The abstract should be **concise, clear, and compelling**
- Do not copy content from the Scientific Justification into the Abstract
- Do not repeat the Abstract in the Scientific Justification

  – space is limited and precious

OT Filling — Abstract Structure Example

Proposal 2019.1.00061.S, PI: Richard Ellis

I-TRAIN (EU ARC) Example

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

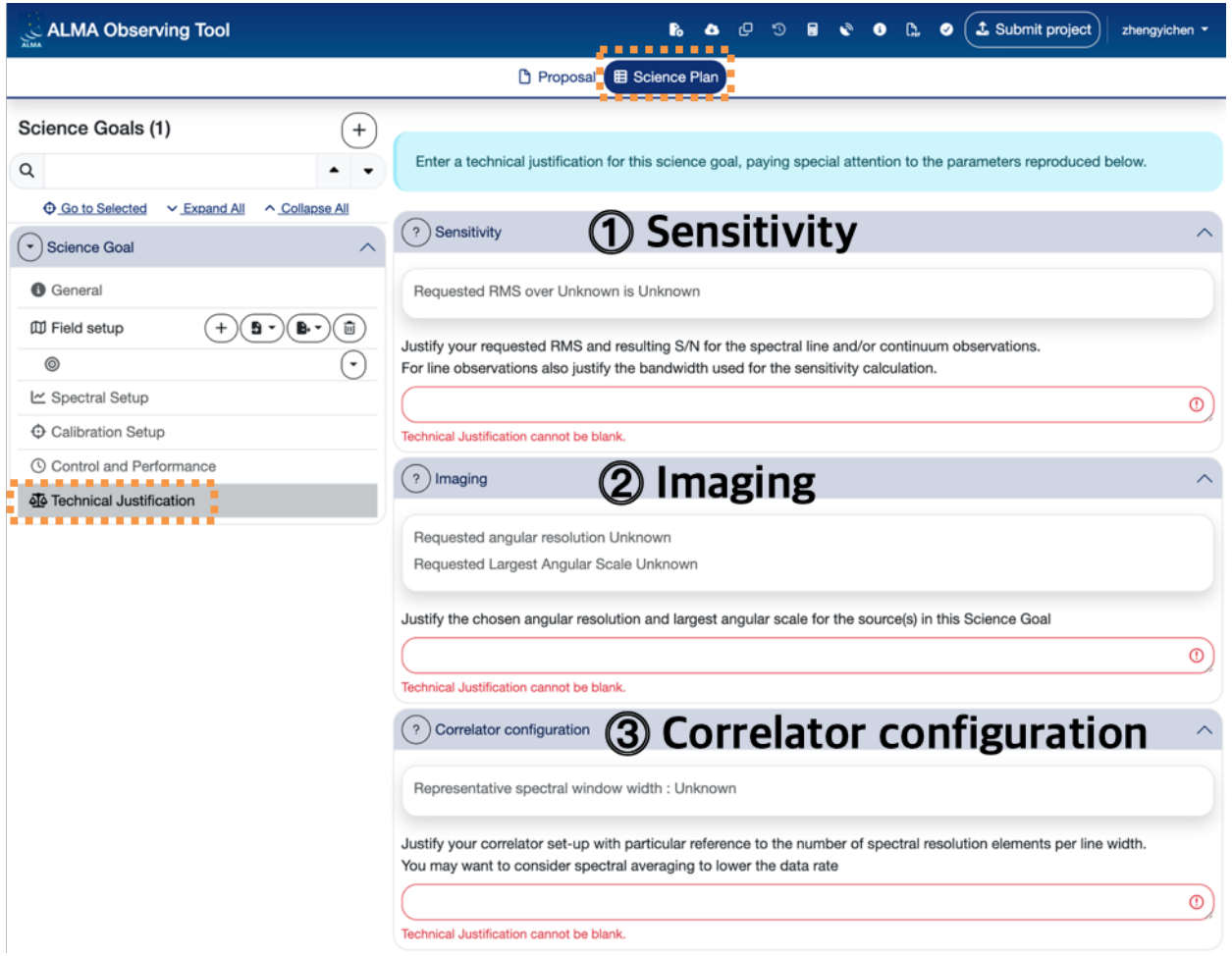
Strategy

Significance

The abstract should convey these elements, but the order can vary. Many PIs start with “We propose…”

OT Filling — Technical Justification

Gianni Cataldi's Talk



- A good technical justification will not win your ALMA time – the Scientific Justification will. However, a poor technical justification will cause reviewer to downgrade your proposal.
- Ensure the technical details — requested time, number of sources, configurations, etc. — are consistent among your cover sheet, scientific justification and technical justification.
- If large amount of your proposal is dominated by one (or few) source(s), justify why that source is crucial or remove it
- **Quantitatively Justify** why the designed setup are necessary for achieving your goal.

OT Filling — Technical Justification: ① Sensitivity

Sensitivity

- Explain in details how your derived the necessary sensitivity
- If possible, discuss mosaic strategy or strategy to optimise a survey
- Include references to support your assumptions

- **Example** ([XXX] placeholder represent quantitative values):
  - For our XXX 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 XXX emitters in our sample.

OT Filling — Technical Justification: ② Imaging

Angular resolution and largest angular scale

- Explain why you chose the requested angular resolution and largest angular scale
- Include references to support your assumptions

- **Example** ([XXX] placeholder represent quantitative values):
  - For our XXX (target) at [Frequency] GHz, we select an angular resolution of [Angular Resolution], corresponding to [Physical Scale] pc at [Distance] Mpc, to resolve key structures like 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 (expand in details). A miner resolution would dilute S/N, while a coarser one would blend structures.

OT Filling — Technical Justification: ③ Correlator Configuration

Correlator Configuration

- 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** ([XXX] placeholder represent quantitative values):
  - For our XXX 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.

3. Cycle 13 Updates, Policies & Others

What's new in Cycle 13

1. What's new in Cycle 13

This section summarizes significant changes made since Cycle 12. Any changes, clarifications, or bugs that are discovered after the publication of this Proposer's Guide will be documented in the Knowledgebase Article:

What Cycle 13 proposal issues and clarifications should I be aware of before submitting my proposal? Proposers should check this article regularly, especially just before submitting their proposals.

1.1 Band 2 on the 12-m Array

Observing capabilities are given in Appendix A and fully described in the ALMA Cycle 13 Technical Handbook (hereafter, the Technical Handbook). New capabilities in Cycle 13 include:

- **Band 2 on the 12-m Array**. Band 2, covering 67–116 GHz, is offered for the 12-m Array, including full polarization with a single pointing.

1.2 Web-based ALMA Observing Tool

Starting in Cycle 13, the desktop-based OT has been replaced by a web-based OT that can be accessed at https://cycle-13.sps.alma.cl. For details on the capabilities of the web-based OT, please see the OT documentation linked in Section 4.6.1.

1.3 Angular Resolution and Maximum Recoverable Scale Tables

The presentation of the Angular Resolution (AR) and Maximum Recoverable Scale (MRS) has been modified to better communicate the range in AR that can be achieved with the operational configurations. An updated Table A-1 shows the ranges in AR that are achievable within a given configuration as a function of observing band. For clarity, the MRS that can be achieved with these configurations has been moved into the new Table A-2. The configurations, ARs, and MRSs have not changed from what was achieved in previous cycles.

1.4 ESO Guaranteed Time Observations

In Cycle 13, up to 24 hours of the European share of ALMA observing time will be allocated as Guaranteed Time Observations (GTOs). These GTOs will be awarded in exchange for contributions to the ALMA Development Program. See Section 3.7 for details.

1.5 Changes to Operational Policies and Procedures

The policy on changes to ALMA proposals has been updated. Several of these items are described below, but for details PIs should review the referenced Proposer's Guide document sections as well as Section 8 and Appendix D of the ALMA Users' Policies.

(Ref.: ALMA Proposer's Guide - Section 1

1. **Band 2 on the 12-m Array** Pei-Ying Hsieh's Talk

   67–116 GHz; including full polarisation in a single pointing

   Gianni Cataldi's Talk
2. **Web-based ALMA Observing Tool**

   Desktop OT replaced by web-based interface
3. **Angular Resolution (AR) and Maximum Recoverable Scale (MRS) Tables updated**

   - Improve presentation

   - No change in actual capabilities
4. **ESO Guaranteed Time (GTO)**

   Up to 24 hours allocated
5. **Policy & procedure updates**

   - Sun avoidance (>15°)

   - Coordinated observations must be stated

   - Time-constrained observations require defined windows

Dual-anonymous peer review - anonymous writing

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 XXX” ❌ → “XXX was observed”✅
        - “Our previous work (Smith et al. 2020) found …” → “Smith et a. (2020) found …”
        - More examples can be found in the ALMA Dual-Anonymous Guidelines
    3. Do NOT include acknowledgements (to avoid revealing collaborations.

Ref.: ALMA Cycle 13 Proposer’s Guide – Section 5.2 & Dual Anonymous Guidelines

Dual-anonymous peer review - anonymous writing

3. Proposal Resubmission

1. “While proposers may note on the proposal cover sheet (in the “Duplicate Observation Justification” box) if they are resubmitting an ongoing proposal from the previous cycle, the proposal code, investigator names, priority grade, and/or ranking of the previous proposal must not be listed.

4. Consequence of Violations of Anonymous Writing

1. Serious violation may lead to disqualification
2. Minor issues would be flagged and communicated to the PI for feedback rather than being treated as formal violations.

Ref.: ALMA Cycle 13 Proposer’s Guide – Section 5.2 & Dual Anonymous Guidelines

Thank you!

Comments? Others?