Tips for writing ALMA proposals

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Have a good idea!

Is the idea clear to you?

What will you learn and achieve?
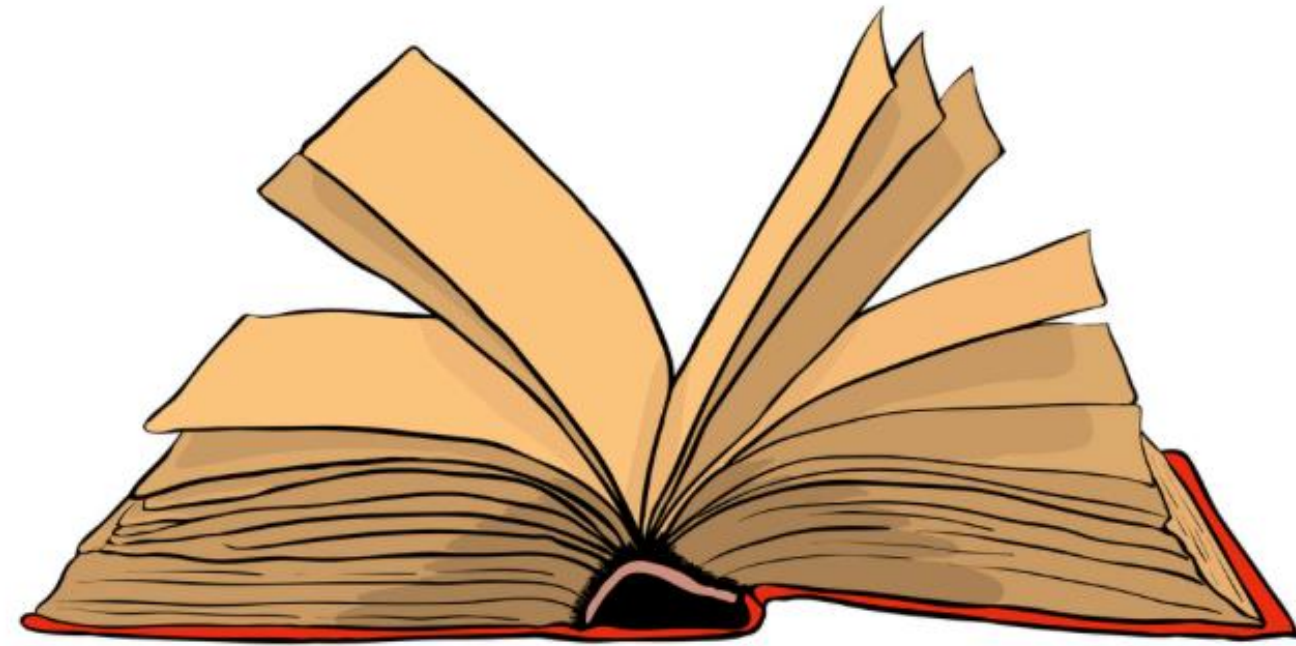
Why should others care?

Be excited!

If you are not excited by the idea,
neither will the reviewer.

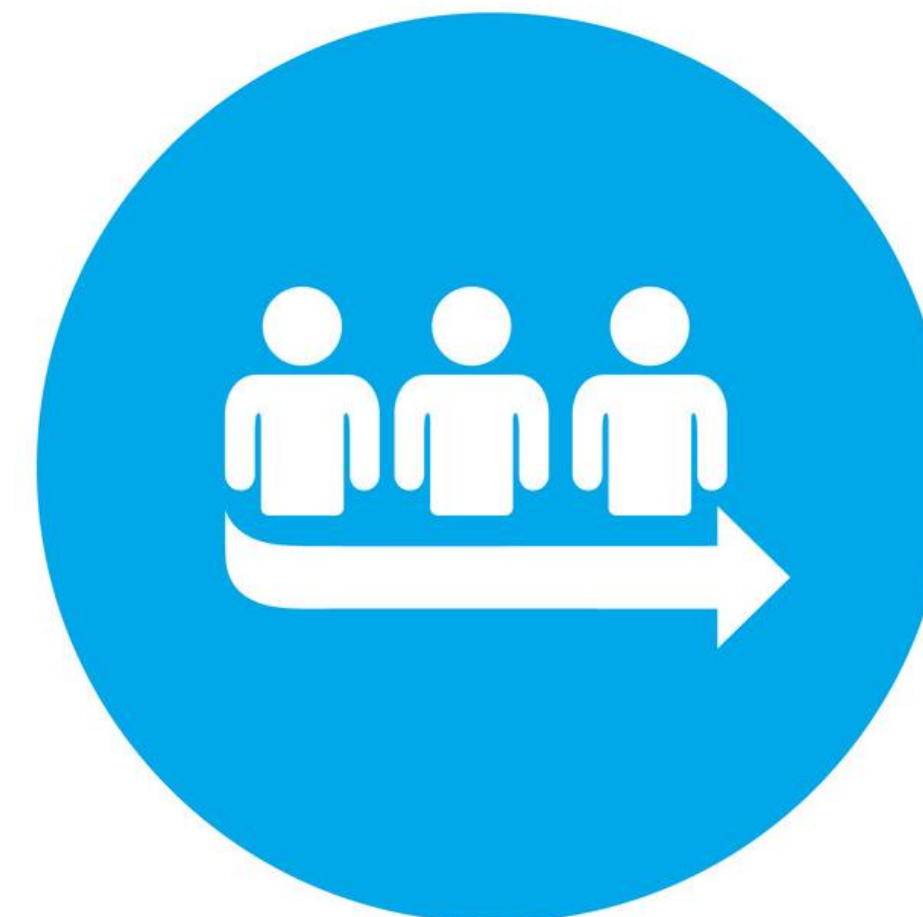# Has it been done already?

Read the literature

Read abstracts of accepted proposals

Search the ALMA Archive

Check the observing queue

Read the documentation

ALMA Cycle 10 Proposer's Guide

ALMA

www.almascience.org

1   What's new in Cycle 10

This section summarizes significant changes made since Cycle 9. 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 10 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.

Dual anonymous format

Proposals must be written following the dual anonymous review guidelines

Basic principle is that the proposal should not reveal the proposal team

Reviewers should focus on the proposed science, and not the proposal team

Guidelines provided on the ALMA Science Portal (Proposing => ALMA Proposal Review).

Review criteria

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

Suitability of the observations to achieve the scientific goals

- 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?
- Does the proposal justify why new observations are needed to achieve the goals?

Know your audience

Reviewers knowledgeable but not necessarily experts
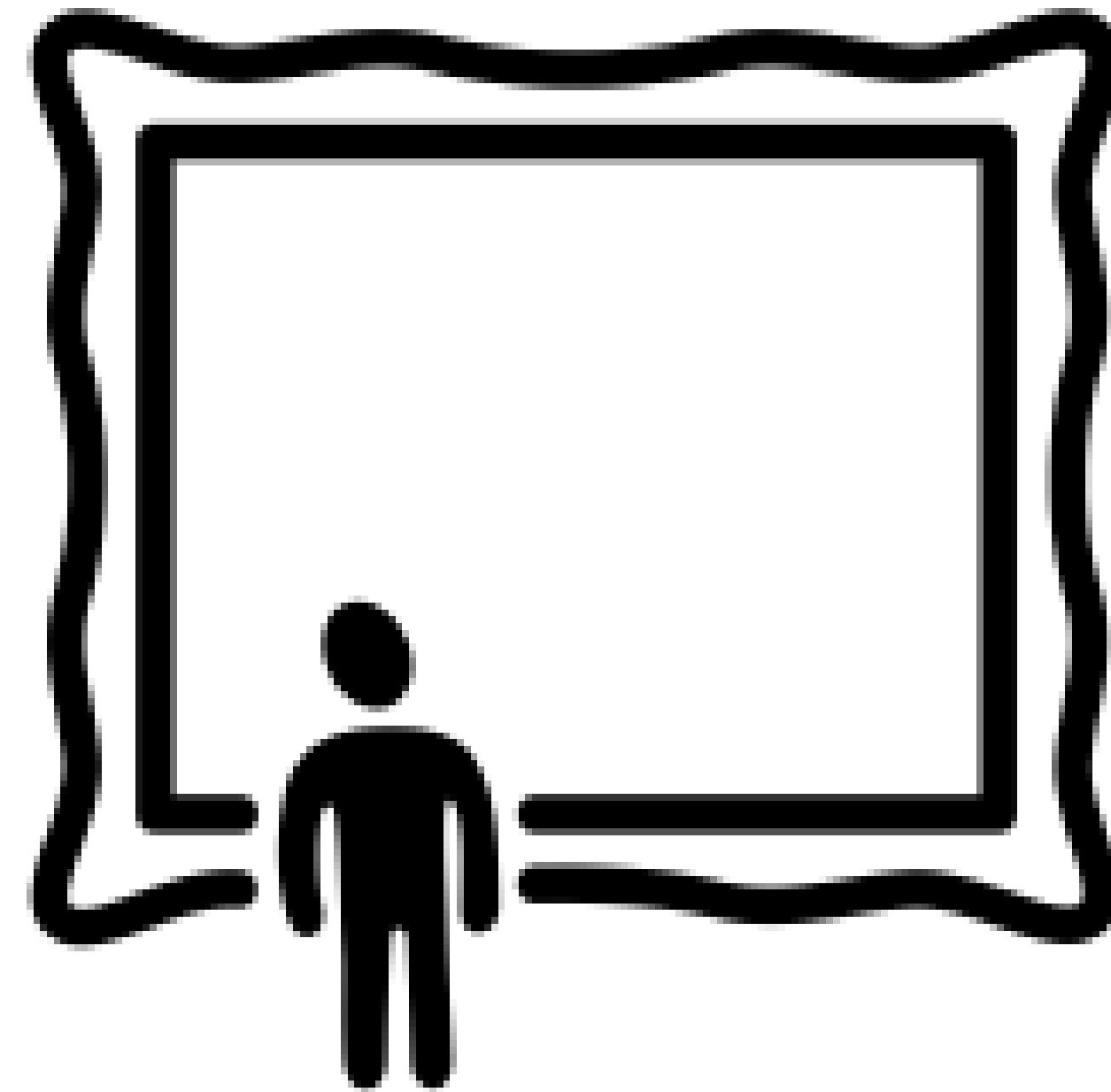
Give big picture on why your proposal is important

Goal of the proposal

Get the reviewer excited about your idea!

Reviewer perspective
- what is the goal of the proposal?
- why is this important?
- how are they going to achieve it?
- why is this proposal more important than the other proposals?
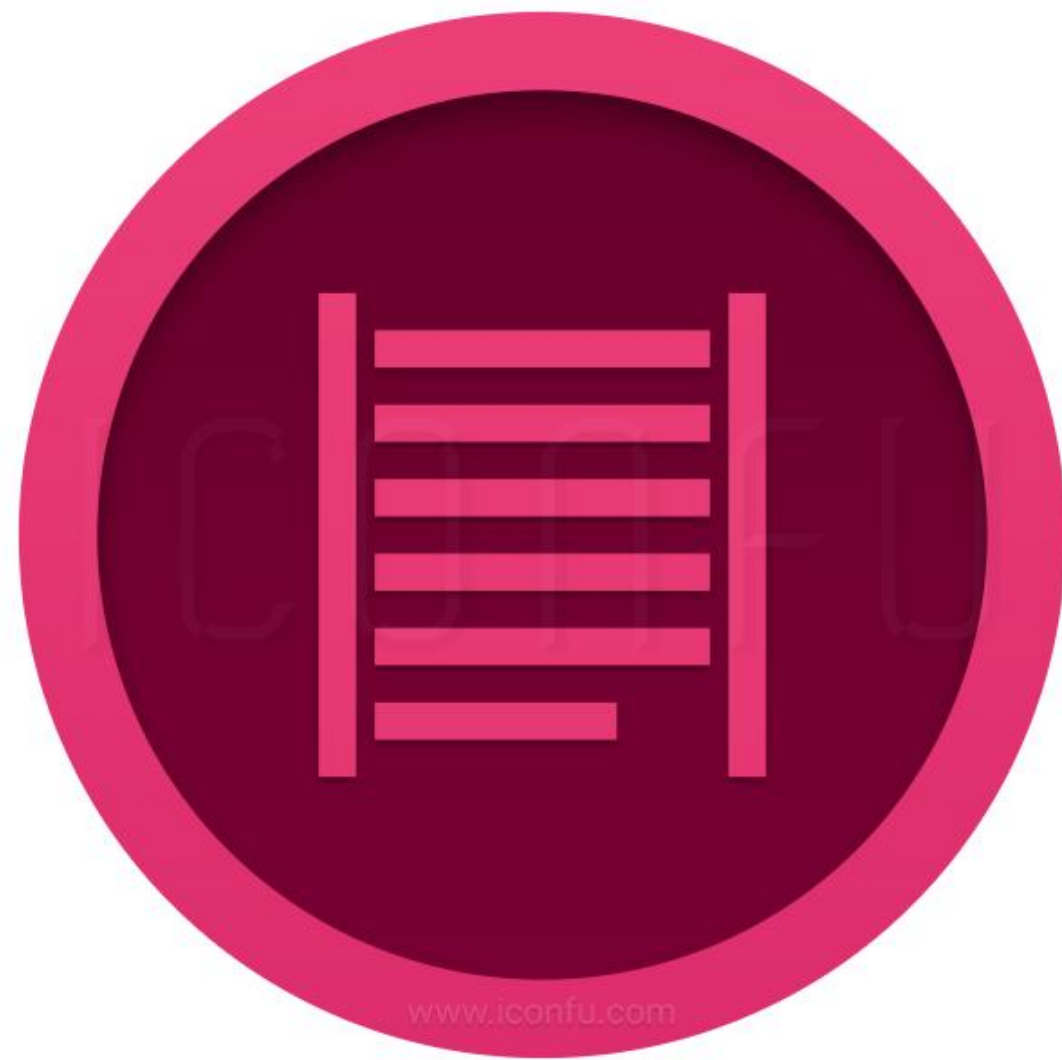
Help the reviewer
- reviewers will be reading 10+ proposals - make it easy for them!
- importance should be understandable to a non-expert
- proposal needs to be clear, concise, and explicit
    - avoid acronyms and jargon, or at least define them
    - do not assume the reviewer will infer your point: say it directly!

Proposal components

Abstract

Scientific Justification

Technical Justification

Abstract

Succinctly and powerfully convey the goal of the proposal

Abstract

Write a clear, concise, and coherent narrative that will excite the reviewer about the project
- do not merely copy portions of the Scientific Justification into the Abstract

Do not repeat the Abstract in the Scientific Justification
- wastes precious space

Scientific Justification: Example outline

Introduction (1 page)

- big picture
- specific problem to be solved
- previous work and unsolved issues
- summary of what you propose to do

4 pages total
~ 2 pages for text
~ 2 pages for figures / tables

=> must be concise!

Methodology (2.5 pages)

- what will you observe and why
- what data you need
- analytic techniques
- plan for interpreting the results and expected impact

Description of observations (0.5 pages)
- salient points only: refer to Technical Justification for details

Scientific Justification: Introduction

Crucial, but often 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 ….

If the reviewer is not excited by your proposal after the first page, it likely will be ranked poorly.

Scientific Justification: Methodology

What will you do with ALMA?

- present specific goals

- describe source(s) to be observed

- requested ALMA data

How will you analyze the data?

- describe analysis techniques / models

- ALMA/CASA simulations are often useful

Expected results and impact

- common (and successful) formula:

  - observe X => prefer model A

  - observe Y => prefer model B

Justify the target(s)

Why is this the **best** source(s) to achieve the science goals?

- closest, to provide the best spatial resolution?
- brightest, to provide the best signal to noise?
- unique?
- wealth of ancillary data?

Survey proposals

List clear, explicit selection criteria

- for example, we selected all sources in Taurus
    - brighter than 10 mJy in the continuum and
    - spectral types between M6 and M9 and
    - no known binary companion

Justify the sample size! Reviewers like …

- complete samples
    - all sources brighter than …
- samples that tie to a quantitative statistics measure
    - by observing 20 sources, we can measure the slope of the mass-luminosity relation to an accuracy of 10%
- samples that extend previous observations by a lot (e.g., 10 times more objects)

Detection experiments

Aim for a significant detection (at least 3 sigma, if not higher)

- 2 sigma detection will not convince anyone

If source is not detected, explain the implications of an upper limit and why it is important.
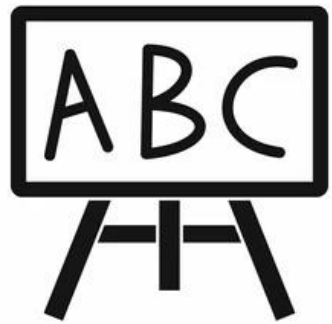
Figures

Figures should be simple and clearly convey a significant point.

- they can better convey the message than dense text
- reviewers will look at the figures (and abstract) to refresh their memory of a proposal, so figures/captions should convey the story of the proposal.

Tell the reviewer what is the point of the figure in the caption.

- do not assume the reviewer will determine the point on their own

Figures and captions should be easily readable

- avoid small fonts and dense spacing

Scientific Justification: Description of observations

Provide brief summary of the observational setup

- angular resolution, largest angular scale, sensitivity, lines
- refer reader to the Technical Justification for the details
- if it is important, put it in the Scientific Justification to make the sure the reviewer sees it

Scientific Justification: References
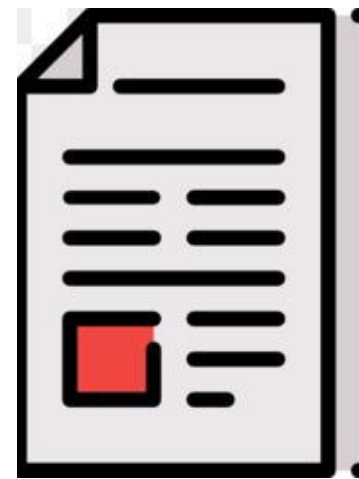
Reference recent literature
- it conveys you are up-to-date on the latest results

Acknowledge other authors work
- while it is not possible to reference everyone, reviewers may get annoyed if you only reference your own work

Do not assume reviewers will consult the references. If it is important, explain it in the Scientific Justification.

Technical Justification

ALMA Observing Tool

OT performs (most) technical validations

=> your proposal is technically doable in terms of sensitivity, resolution, etc…

Sensitivity

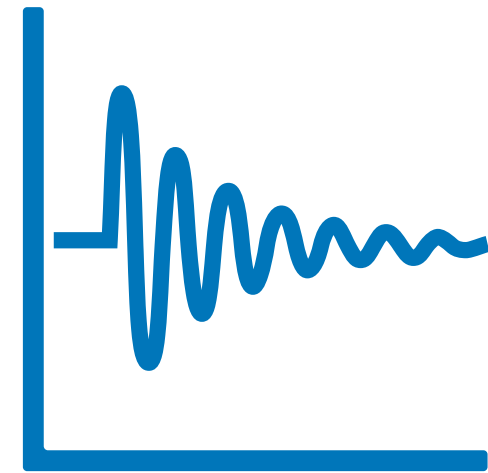Angular resolution

Largest angular scale

Correlator setup

Convince the reviewer that the technical set up…
- can achieve the scientific goals of the proposal
- is the best setup to achieve the science goals
- uses ALMA time in the most efficient way

Technical Justification

Sensitivity

- explain in detail how you derived the necessary sensitivity
- if applicable, discuss mosaic strategy or strategy to optimize a survey
- include references to support your assumptions

Repeat critical information from the Technical Justification in the Scientific Justification. For example, the observed lines, continuum band, angular resolution, etc…

Technical Justification

Angular resolution and largest angular scale

- explain why you chose the requested angular resolution and largest angular scale (be quantitative)
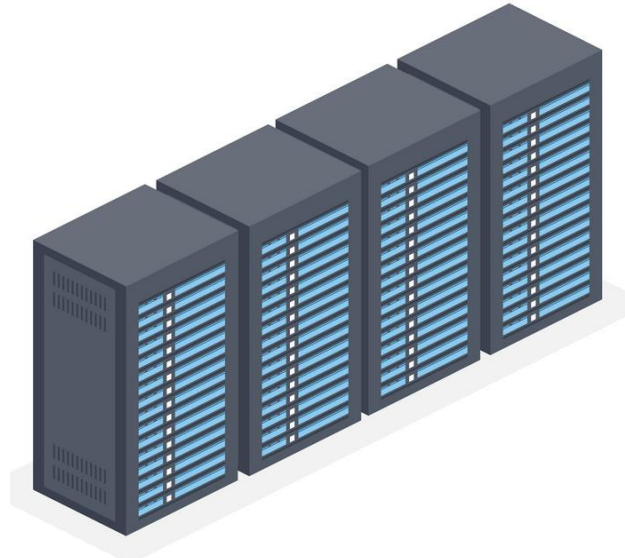- include references to support your assumptions

Repeat critical information from the Technical Justification in the Scientific Justification. For example, the observed lines, continuum band, angular resolution, etc…

Technical Justification

Correlator setup

- explain why you chose the observed band / lines

- need to justify Band 6 vs. Band 7 continuum, ^{12}CO 2-1 vs. ^{12}CO 1-0, etc...

- if observing extra lines for "free" to maximize archival value/serendipity, then say so.

Repeat critical information from the Technical Justification in the Scientific Justification. For example, the observed lines, continuum band, angular resolution, etc…

Technical Justification: Things to consider

High frequencies and high resolution are challenging during afternoon/early-evening and Chilean summer.

Examine time of year and time of day your source would be observed given the configuration schedule and weather (see next slide).

- consider if a different combination of configuration / band would be more favorable
- mention this in the Technical Justification; it shows you are careful
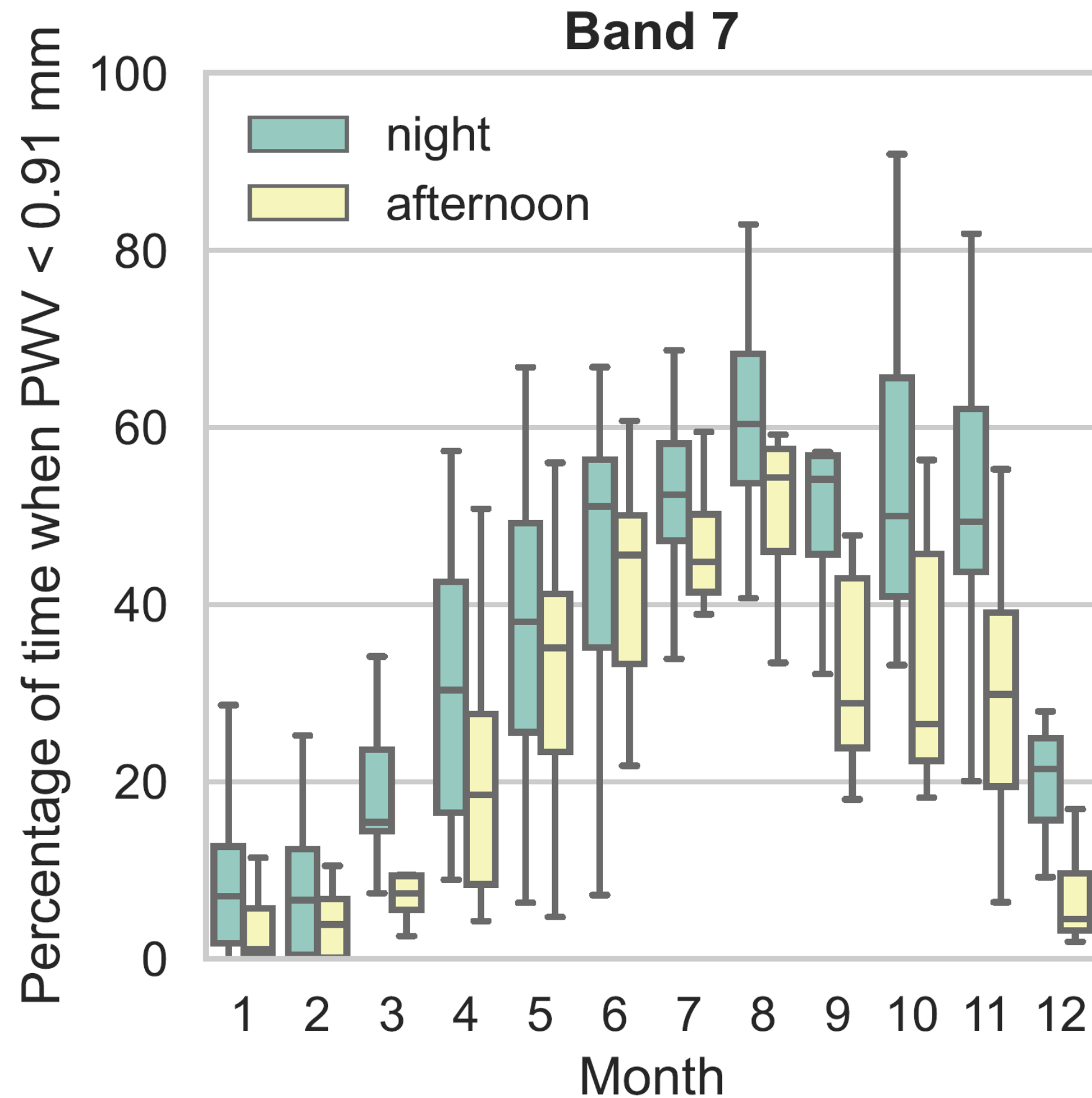
Reviewers are aware that high frequencies are challenging.

- proposal must justify why the science cannot be achieved at a lower frequency
- may even be worthwhile to mention in Scientific Justification

Weather and configuration schedule

PWV vs. month of the year

Band 7

Configuration schedule

Start date	Configuration	Longest baseline	LST for best observing conditions
2023 October 1	C-8	8.5 km	∼ 22—10 h
2023 October 20	C-7	3.6 km	∼ 23—11 h
2023 November 10	C-6	2.5 km	∼ 1—13 h
2023 December 1	C-5	1.4 km	∼ 2—14 h
2023 December 20	C-4	0.78 km	∼ 4—15 h
2024 January 10	C-3	0.50 km	∼ 5—17 h
2024 February 1	*No observations due to maintenance*		
2024 March 1	C-1	0.16 km	∼ 8—21 h
2024 March 26	C-2	0.31 km	∼ 9—23 h

Figures 2 and 3 in Proposer's Guide   **Table 3 in Proposer's Guide**

Configuration properties

Table A-1: Angular Resolutions (AR) and Maximum Recoverable Scales (MRS) for ALMA configurations

		Band	1	3	4	5	6	7	8	9	10
Config.	L_{max}	Freq. (GHz)	40	100	150	185	230	345	460	650	870
	L_{min}										
7-m	45 m	θ_{res} (arcsec)	31.5	12.5	8.35	6.77	5.45	3.63	2.72	1.93	1.44
	9 m	θ_{MRS} (arcsec)	167	66.7	44.5	36.1	29.0	19.3	14.5	10.3	7.67
C-1	161 m	θ_{res} (arcsec)	8.45	3.38	2.25	1.83	1.47	0.98	0.74	0.52	0.39
	15 m	θ_{MRS} (arcsec)	71.2	28.5	19.0	15.4	12.4	8.25	6.19	4.38	3.27
C-2	314 m	θ_{res} (arcsec)	5.75	2.30	1.53	1.24	1.00	0.67	0.50	0.35	0.26
	15 m	θ_{MRS} (arcsec)	56.5	22.6	15.0	12.2	9.81	6.54	4.90	3.47	2.59

Angular resolution

Min/max antenna separations

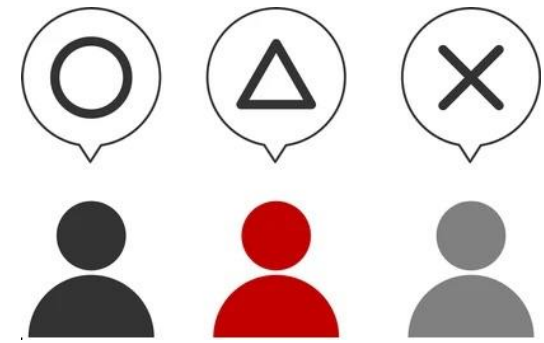**Maximum recoverable scale**

Configuration

Technical Justification is important!

A good technical justification will not win you ALMA time - only the Scientific Justification will.
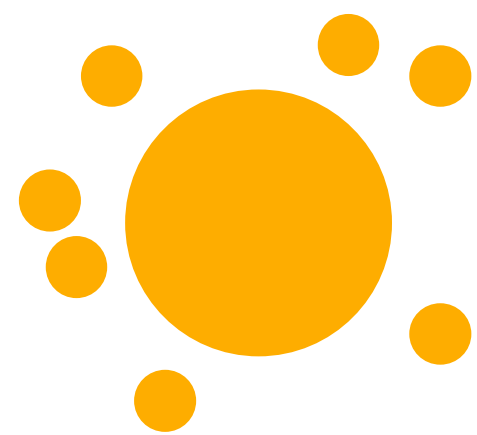
However, a poor technical justification will cause reviewers to downgrade your proposal.

Reviewers do not like …

Inconsistencies between cover sheet, scientific justification & technical justification
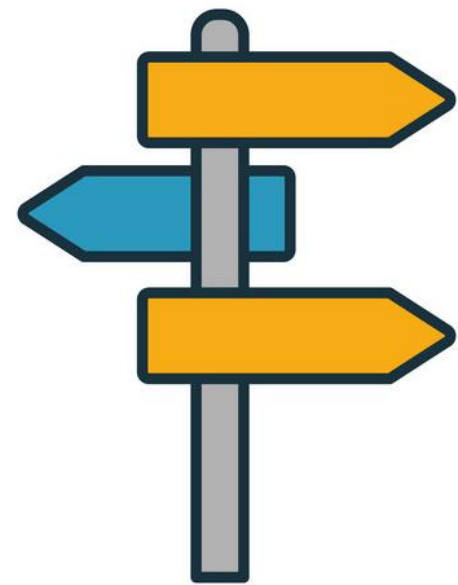- e.g.,   requested time / number of sources   / configurations

Vast majority of time in your proposal is dominated by one (or few) source(s)
=> justify why that source is crucial or remove it

Reviewers do not like …

Vague generalities
- "increase our understanding"
- "help to constrain models"

=> be specific!

Over the top claims
- Rosetta Stone
- Holy Grail

Reviewers do not like …

Tiny fonts / small margins / tight line spacings
=> angers your reviewer!

Overuse of **bold** / *italics* / underline
=> if you use it, use it sparingly

Spelling mistakes, grammatical errors
=> proofread your proposal … again

Questions? Comments?