How to Write & Review ALMA proposals

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PART 1 :
Writing an ALMA proposal!

Have a good idea!

- Is the idea clear to you?
- What is the question will you address? What will you learn?
- Why should others care?

- If you are not excited, neither will be the reviewer.

Have a good idea!

- Is the idea clear to you?
- What is the question will you address? What will you learn?
- Why should others care?

Be excited!

- If you are not excited, neither will be the reviewer.

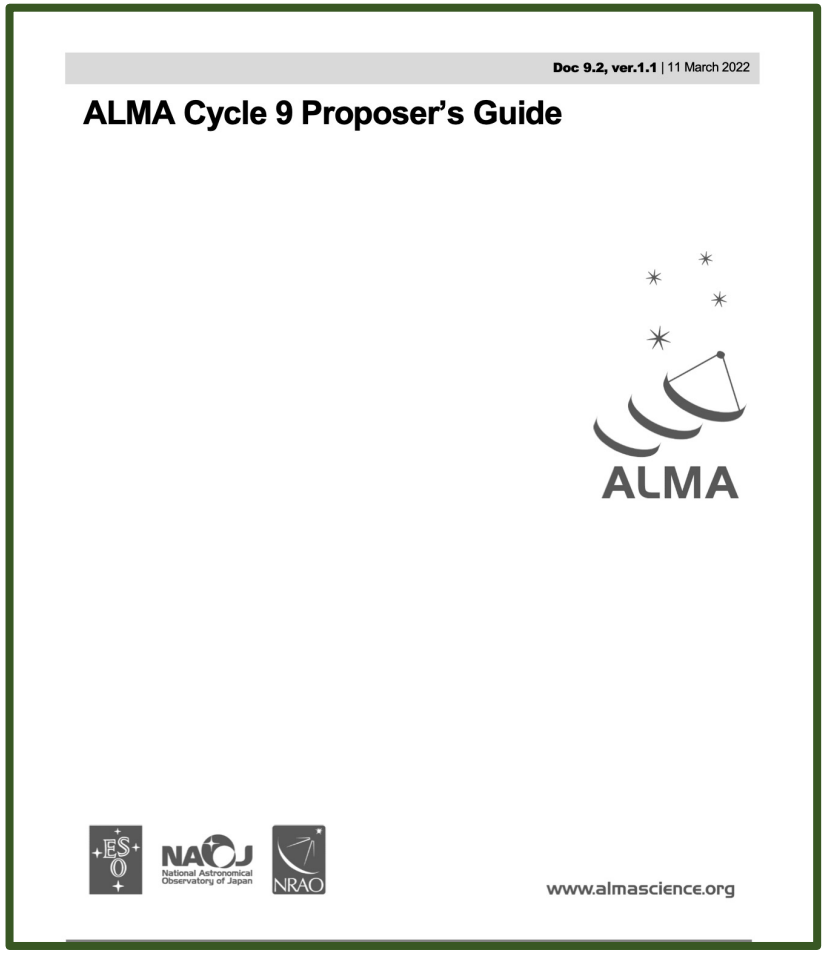
Research your idea

Has it been done already?

Read the literature and the abstracts of accepted proposals

Search the ALMA archive or the observing queue

Read the documentation



What's new in Cycle 9

This section summarizes significant changes made since Cycle 7. Additionally, any changes, clarifications, or bugs that are discovered after the publication of this Proposer's Guide will be documented in the Knowledgebase Article:

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.

https://almascience.eso.org/documents-and-tools/cycle9/

Identify the goals of the proposal

Get the reviewer excited about your idea!

Reviewer perspective

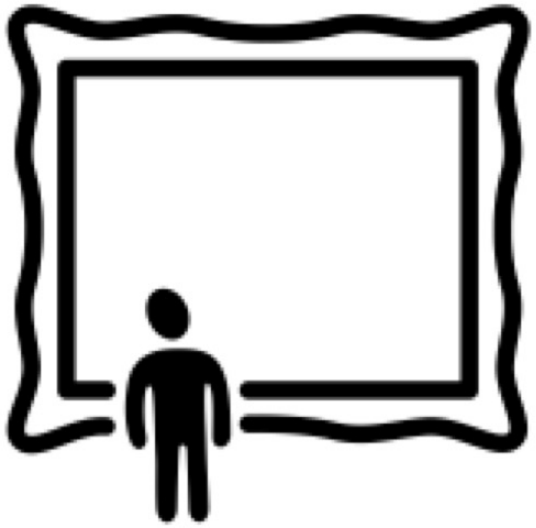
- What is the goal of the proposal?
- Why is this important?
- How are they are going to achieve it?
- Why is this proposal more important than the other proposals?

Help the reviewer

- reviewers will need to read 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!

Know your audience

Reviewers knowledgeable but not necessarily experts



Give big picture on why your proposal is important

Understand the 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 present a clear and appropriate data analysis plan?

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, spectral setup, and u-v coverage sufficient to achieve the science goals?

Proposal components

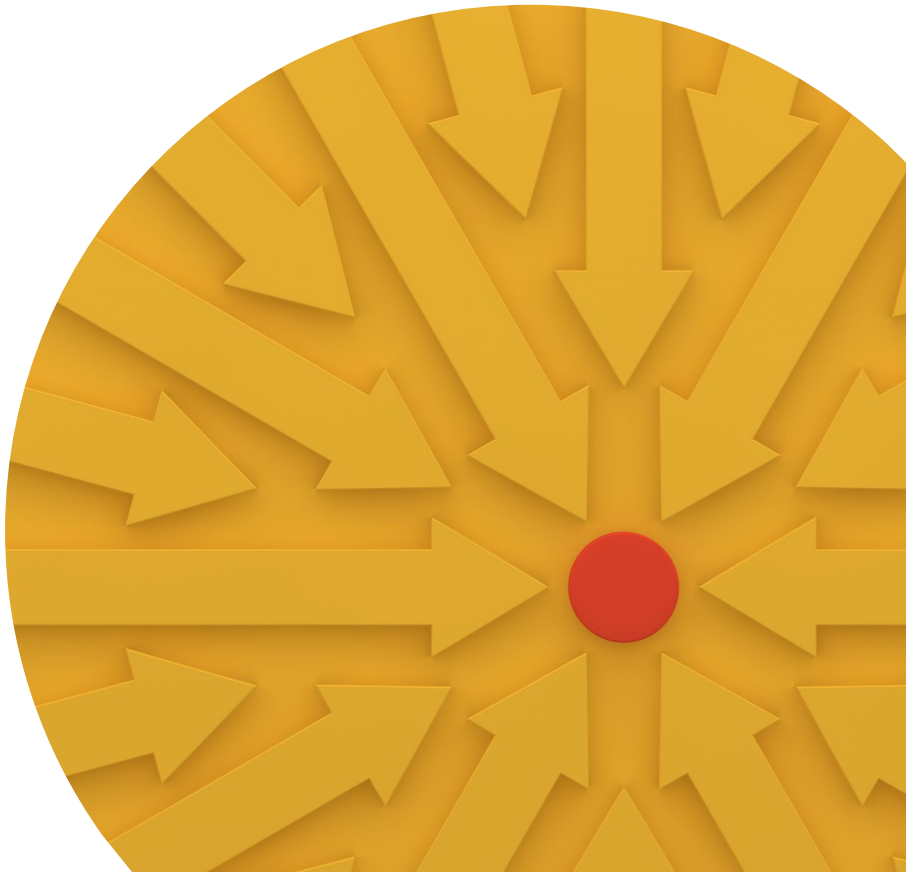
Abstract

Scientific Justification

Technical Justification

Abstract

Briefly and powerfully convey the big picture, the problem, the observations proposed, and the goals of the proposal.



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

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

Abstract

- The abstract should offer a concise, clear and coherent narrative that will excite the reviewers about your project
  - Do not copy portions of the science justifications into the abstract
  - And do not repeat the Abstract in the science justification (space is precious!)

Proposal components

Abstract

Scientific Justification

Technical Justification

Science 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

Science 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 will be ranked poorly.

Science Justification: Motivation

What will you do with ALMA?

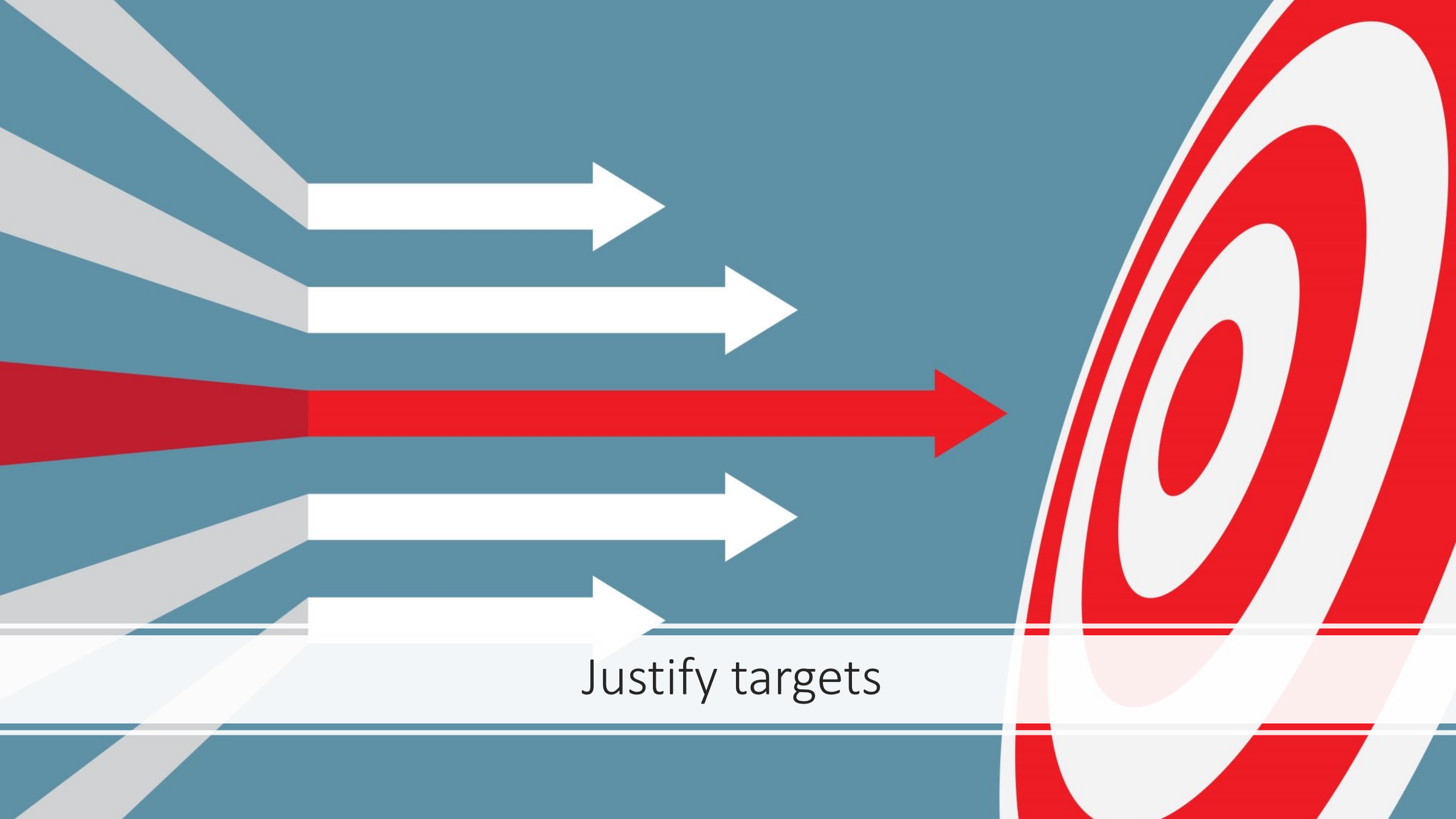
- present specific goals
- describe source(s) to be observed
- requested ALMA data

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 targets

Why is this the **best** source(s) to observe 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?

Justify targets

Survery proposals

List clear, explicit selection criteria.

- 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, statistical measure
  - by observing 20 sources we can measure the slope of the mass-luminosity to 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.

Detection experiments

Figures

Figures should be simple and clearly convey a significant point.

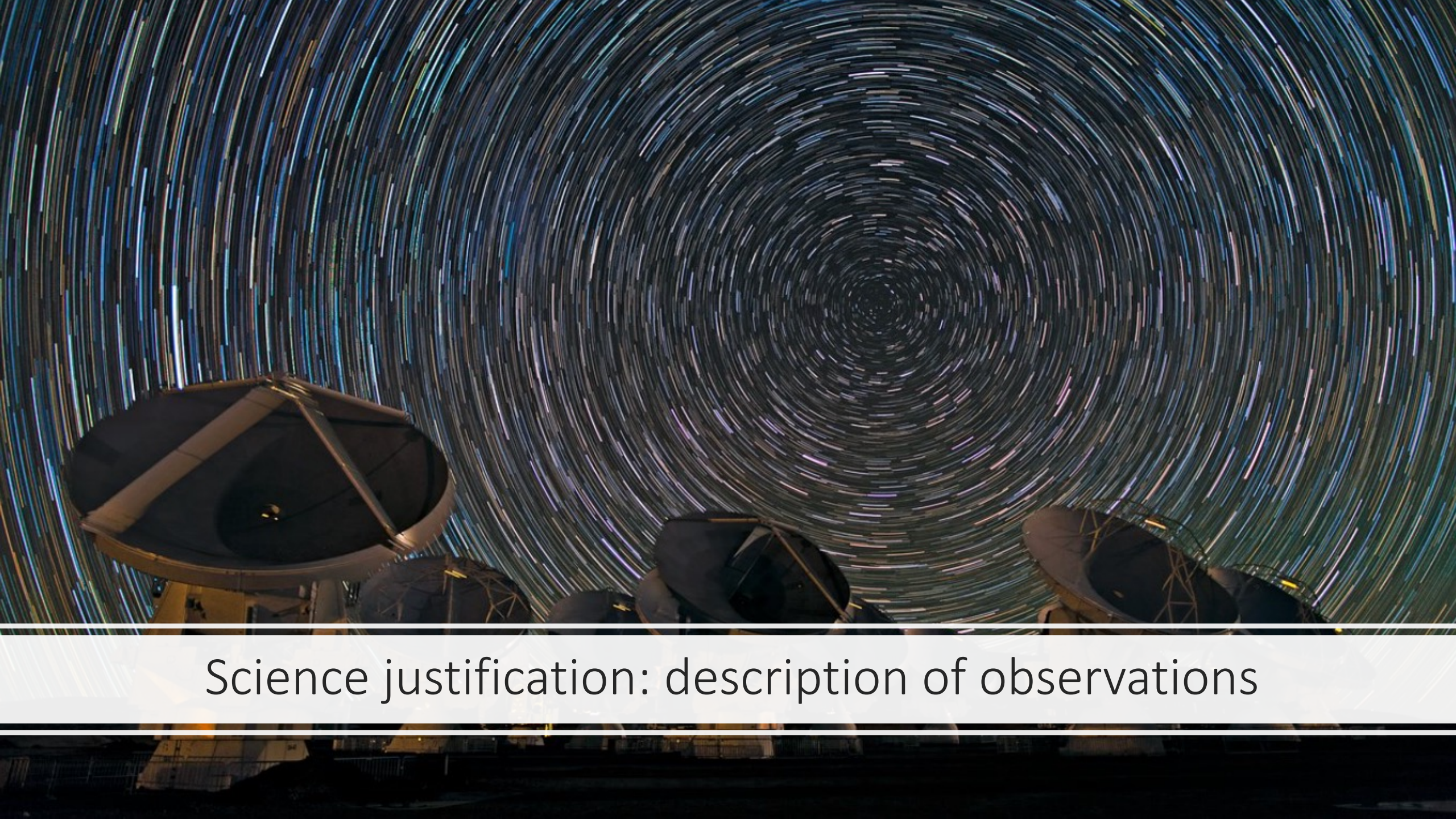
- they can better convey the message than dense text
- reviewers will look at the figures (and abstract) to refresh their memory a proposal, so figures/captions should convey the story of the proposal.

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

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

Figures and captions should be easily readable

- avoid small fonts and dense spacing



Science 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 sure the reviewer sees it

Science justification: description of observations

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

Reviewers will not consult the references. If it is important, explain it in the Scientific Justification.

Proposal components

Abstract

Scientific Justificatio

Technical Justification

Technical Justification

OT performs (most) technical validations

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

Sensitivity

Angular resolution

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
- OK to include references

Angular resolution and largest angular scale

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

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

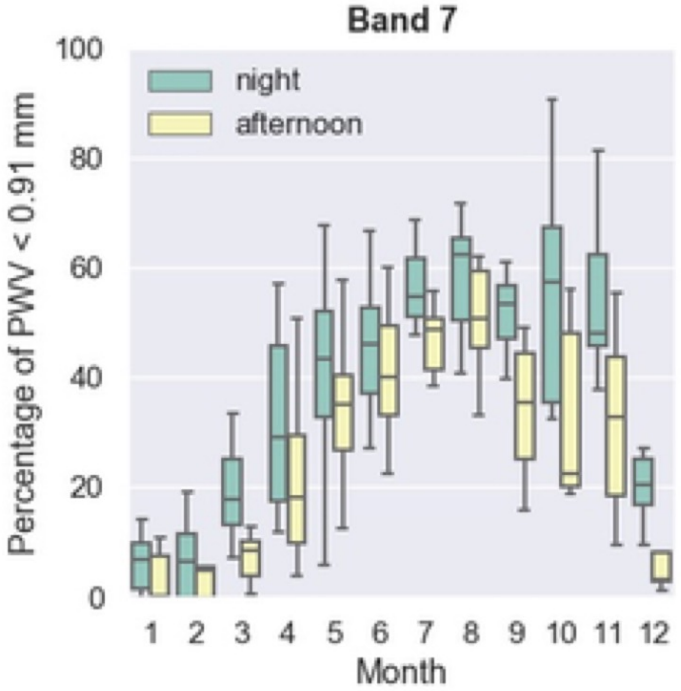
High frequencies and high resolution are challenging during afternoon/early-evening and Chilean summer.

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

Weather and configuration schedule

PWV vs. month of the year



Figures 2 and 3 in Proposer's Guide

Configuration schedule

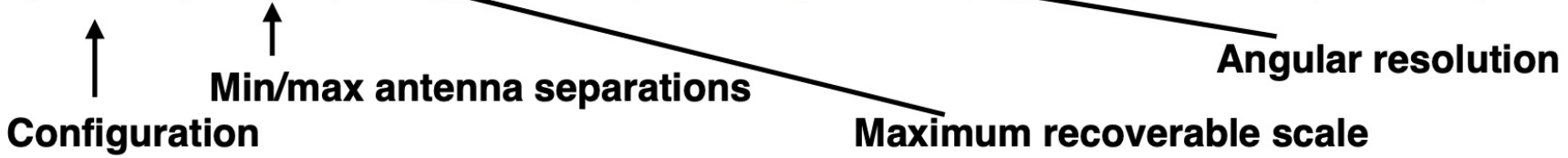
Start date	Configuration	Longest baseline	LST for best observing conditions
2021 October 1	C-8	8.5 km	~ 22—10 h
2021 October 20	C-7	3.6 km	~ 23—11 h
2021 November 20	C-6	2.5 km	~ 1—13 h
2021 December 1	C-5	1.4 km	~ 2—14 h
2021 December 20	C-4	0.78 km	~ 4—15 h
2022 January 10	C-3	0.50 km	~ 5—17 h

Table 4 in Proposer's Guide

Configuration properties

Table A-1: Angular Resolutions (AR) and Maximum Recoverable Scales (MRS) for the Cycle 8 2021 configurations

Config	Lmax		Band 3	Band 4	Band 5	Band 6	Band 7	Band 8	Band 9	Band 10
	Lmin		100 GHz	150 GHz	185 GHz	230 GHz	345 GHz	460 GHz	650 GHz	870 GHz
7-m	45 m	AR	12.5”	8.4”	6.8”	5.5”	3.6”	2.7”	1.9”	1.4”
	9 m	MRS	66.7”	44.5”	36.1”	29.0”	19.3”	14.5”	10.3”	7.7”
C-1	161 m	AR	3.4”	2.3”	1.8”	1.5”	1.0”	0.74”	0.52”	0.39”
	15 m	MRS	28.5”	19.0”	15.4”	12.4”	8.3”	6.2”	4.4”	3.3”
C-2	314 m	AR	2.3”	1.5”	1.2”	1.0”	0.67”	0.50”	0.35”	0.26”
	15 m	MRS	22.6”	15.0”	12.2”	9.8”	6.5”	4.9”	3.5”	2.6”



The 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.

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The technical justification is important

Contact your ARC Node for help!!!

Reviewers do not like…

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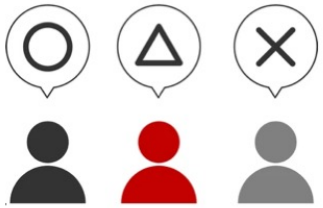
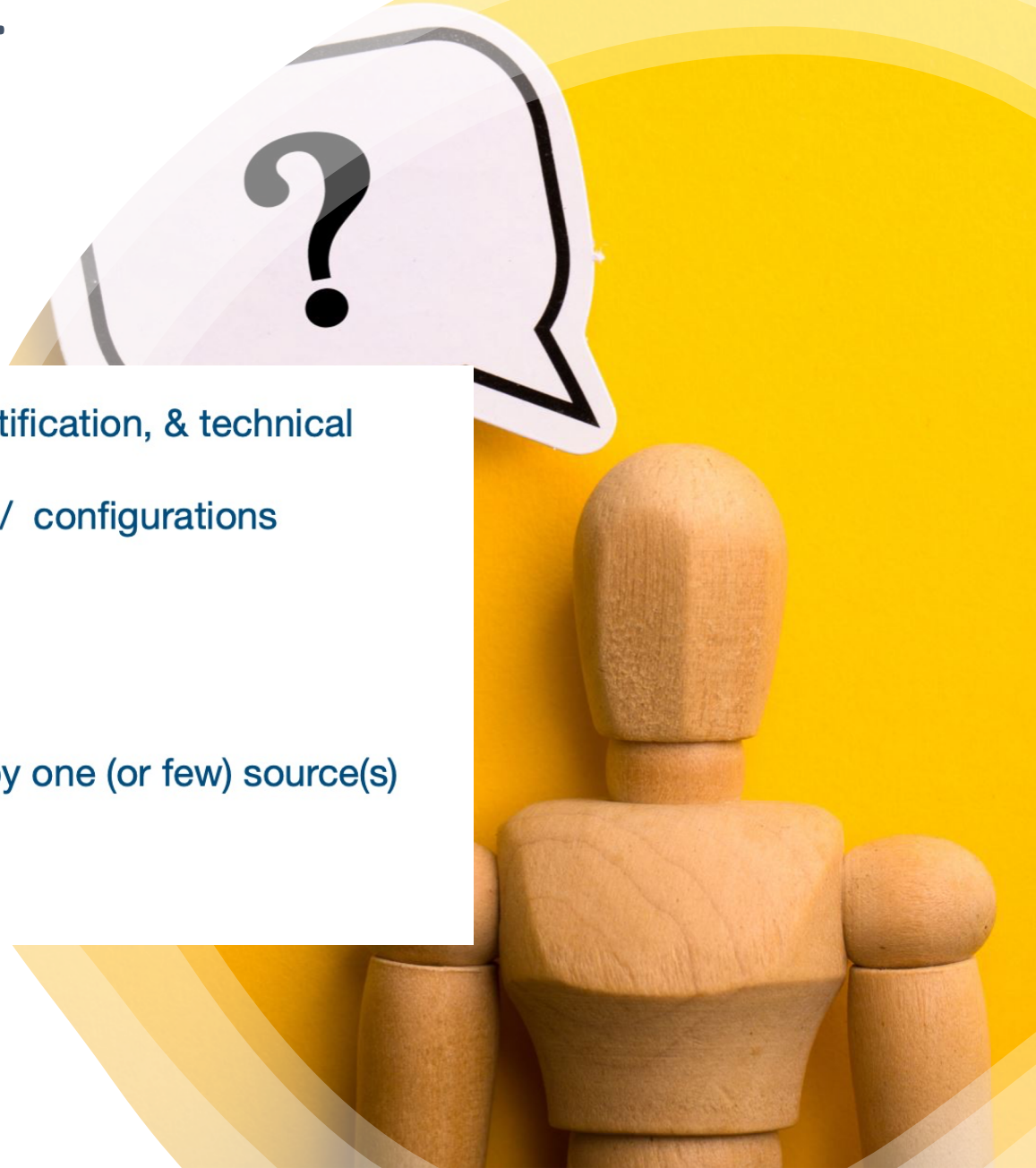


Inconsistencies between cover sheet, scientific justification, & technical justification

- e.g., requested time / number of sources / configurations

Vast majority of time in your project 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

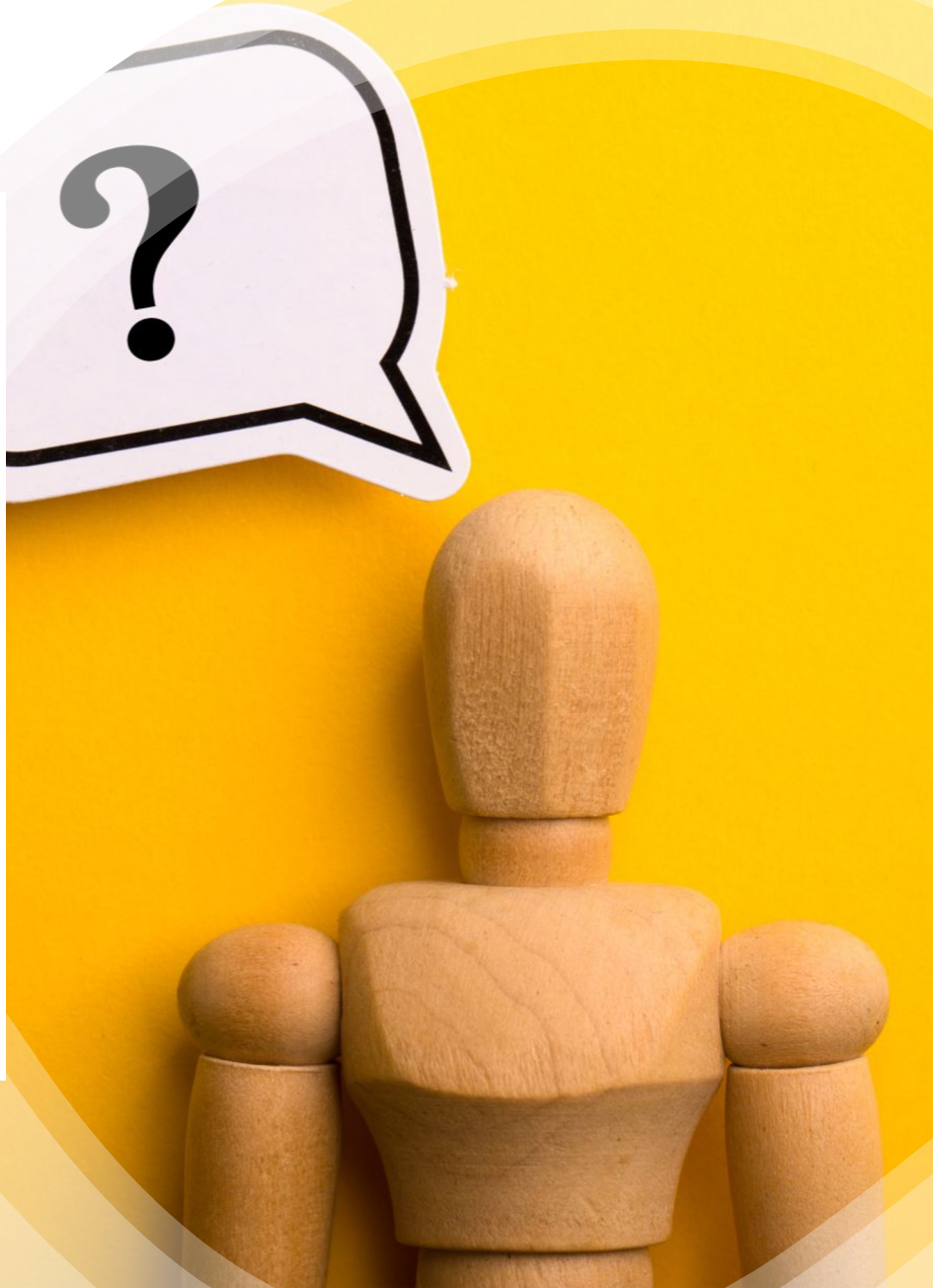
=> angers your reviewer!

Overuse of **bold**/*italics*/<u>underline</u>

=> If you use it, use it sparingly.

Spelling mistakes, grammatical errors

=> proofread your proposal … again



And a final reminder…
proposals must be written anonymously

Proposal should not reveal the proposing team

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

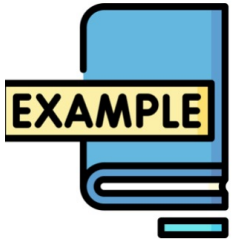
Guidelines provided on the ALMA Science Portal (Proposing => ALMA Proposal Review).

- Do not list the PI, co-PIs, or co-Is anywhere in the proposal

- Including Abstract, Scientific Justification, and Technical Justification

Use the third person

- Reference your own work in the third person



~~*In Smith et al. (2018), we demonstrated …*~~

~~*Our study (Hayashi et al. 2021) showed that …*~~

As demonstrated in Smith et al. (2018), …

Hayashi et al. (2021) showed that …

Use the third person

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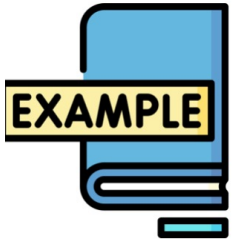


~~*In Smith et al. (2018), we demonstrated …*~~

~~*Our study (Hayashi et al. 2021) showed that …*~~

As demonstrated in Smith et al. (2018), …

Hayashi et al. (2021) showed that …

- Do not name the PI when listing a project code, even if it is not your own project

~~*Figure 1 shows the image from the Cycle 7 program (2091.1.02045.S, PI Pérez).*~~

Figure 1 shows the image from the Cycle 7 program (2019.1.02045.S)

Questions? Comments?

PART 2 :
Reviewing an ALMA proposal!

Let me start with some practical steps …

Basics of distributed peer review

Every* proposal team nominates one person to be a reviewer

Proposal Handling Team (PHT) assigns 10 proposals to the reviewer

Reviewer ranks and write comments for each proposal

* Excluding Large Proposals

A timeline for Cycle 9

April 21
Proposal deadline

1) Proposal PI designates the reviewer in Observing Tool (OT)

April 26
Expertise & conflicts

1) Reviewer specify scientific expertise in User Profile
2) Reviewer provide list of conflicts of interest in User Profile **NEW!!!**

May 4 - June 1
Stage 1

1) Declare any conflicts of interest in assigned proposals by May 11
2) Complete reviews by June 1 @ 15 UT **(MANDATORY!)**

June 2 - 16
Stage 2

1) Read reviews from other reviewers (optional)
2) Modify your ranks and comments as needed (optional)

Review Proposals: Stage 1

May 4 - June 1
Stage 1

1) Declare any conflicts of interest in assigned proposals by May 11
2) Complete reviews by June 1 @ 15 UT **(MANDATORY!)**

- Rank the proposals from 1 (strongest) to 10 (weakest) based on scientific merit.

- Write comments that summarize the strengths and weaknesses of the proposal
- Comments will be sent to the PI verbatim.

- **Reviewer's proposal will be canceled if the reviews are not submitted on time!**
- Extensions will not be granted since Stage 2 starts on June 2.

The reviewer can be changed after the proposal deadline in exceptional circumstances by having the proposal PI contact the PHT. The Stage 1 deadline though will remain the same.

Stage 2

June 2 - 16
Stage 2

1) Read reviews from other reviewers (optional)
2) Modify your ranks and comments as needed (optional)

Read comments from the other reviewers to see if you overlooked any critical strengths or weaknesses.

Update your ranks and comments as needed.

Stage 2 is optional. If a reviewer does not complete Stage 2, the Stage 1 ranks/comments are considered final.

How are proposals assigned?

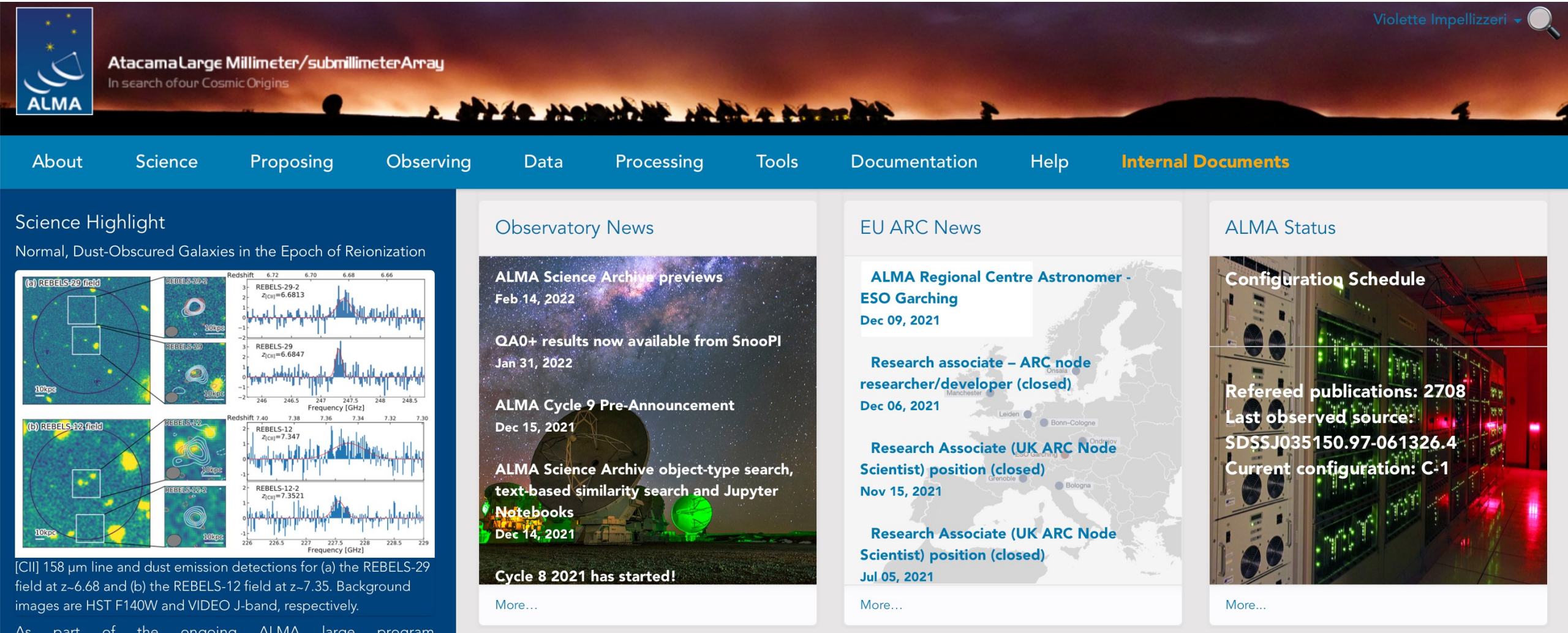
Priority #1 Assign proposals with the same keyword as the reviewer's selected keywords.

Priority #2 Assign proposals in the same scientific category as the reviewer's expertise.

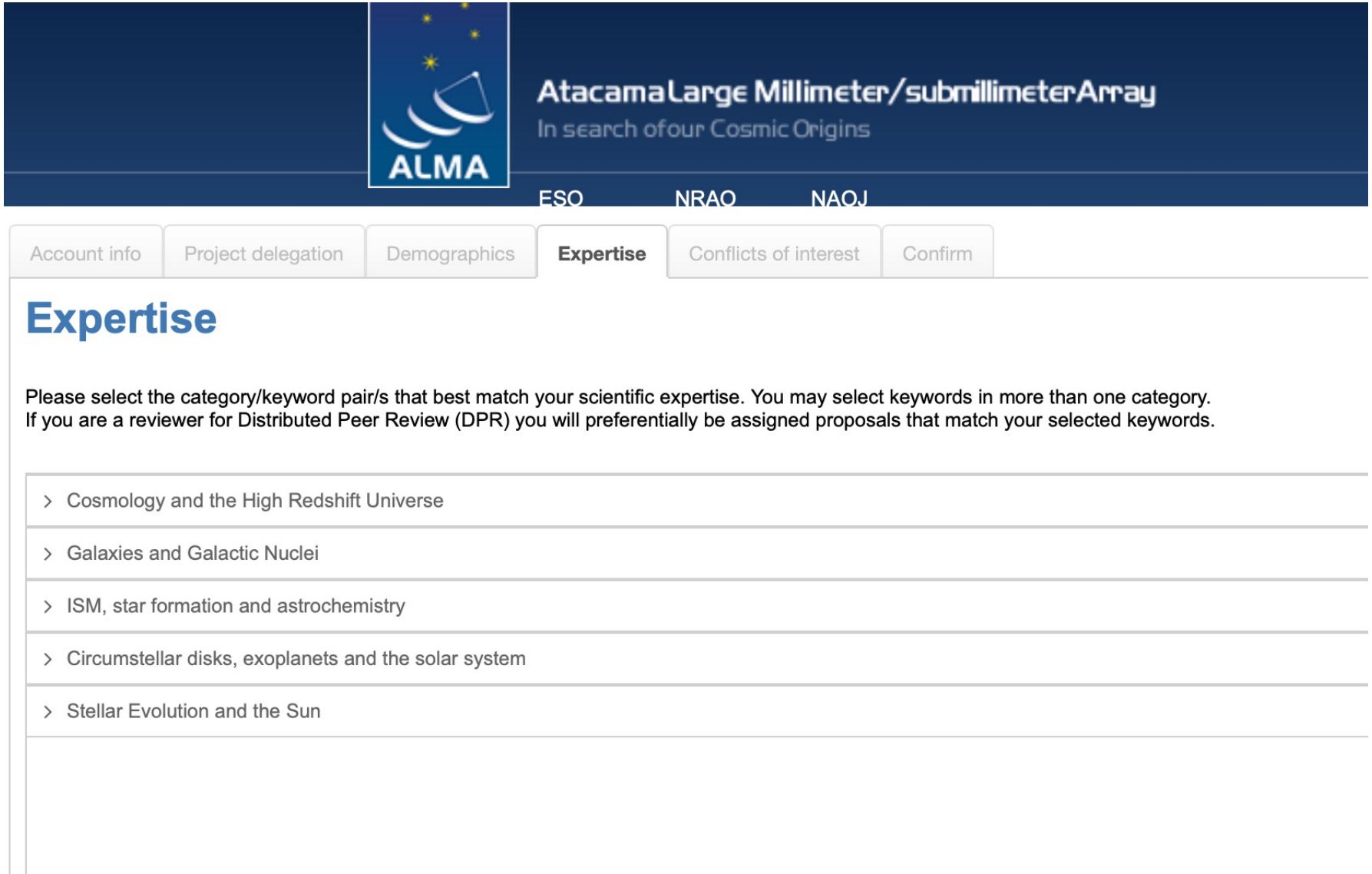
Priority #3 Assign proposals in other scientific categories.

How to define your reviewer expertise/keywords

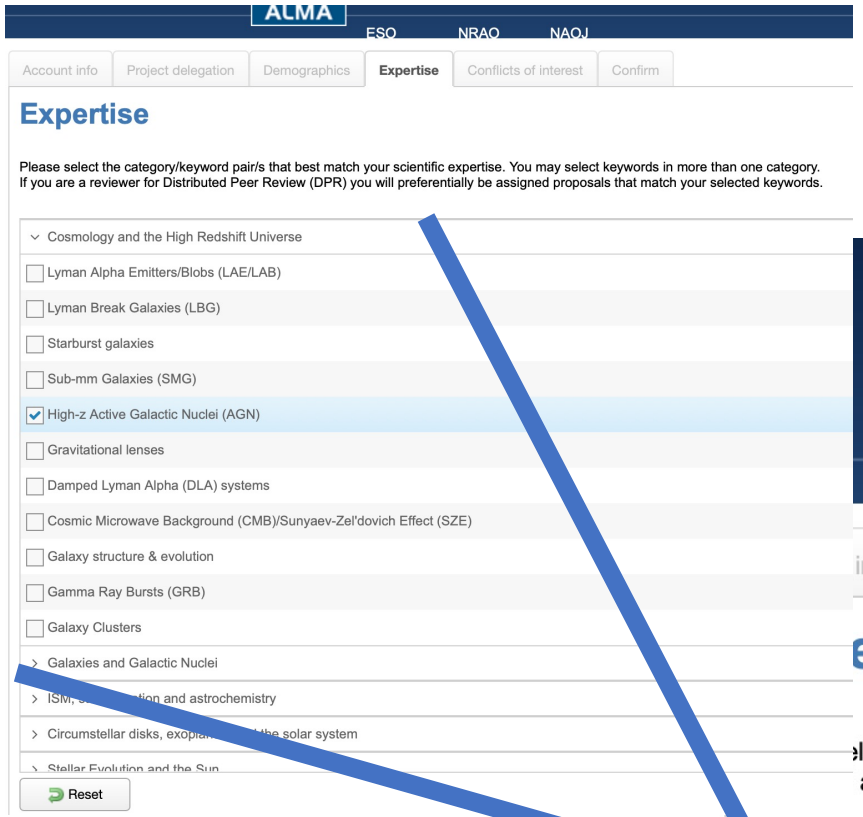
GO TO the Alma science portal: almascience.eso.org

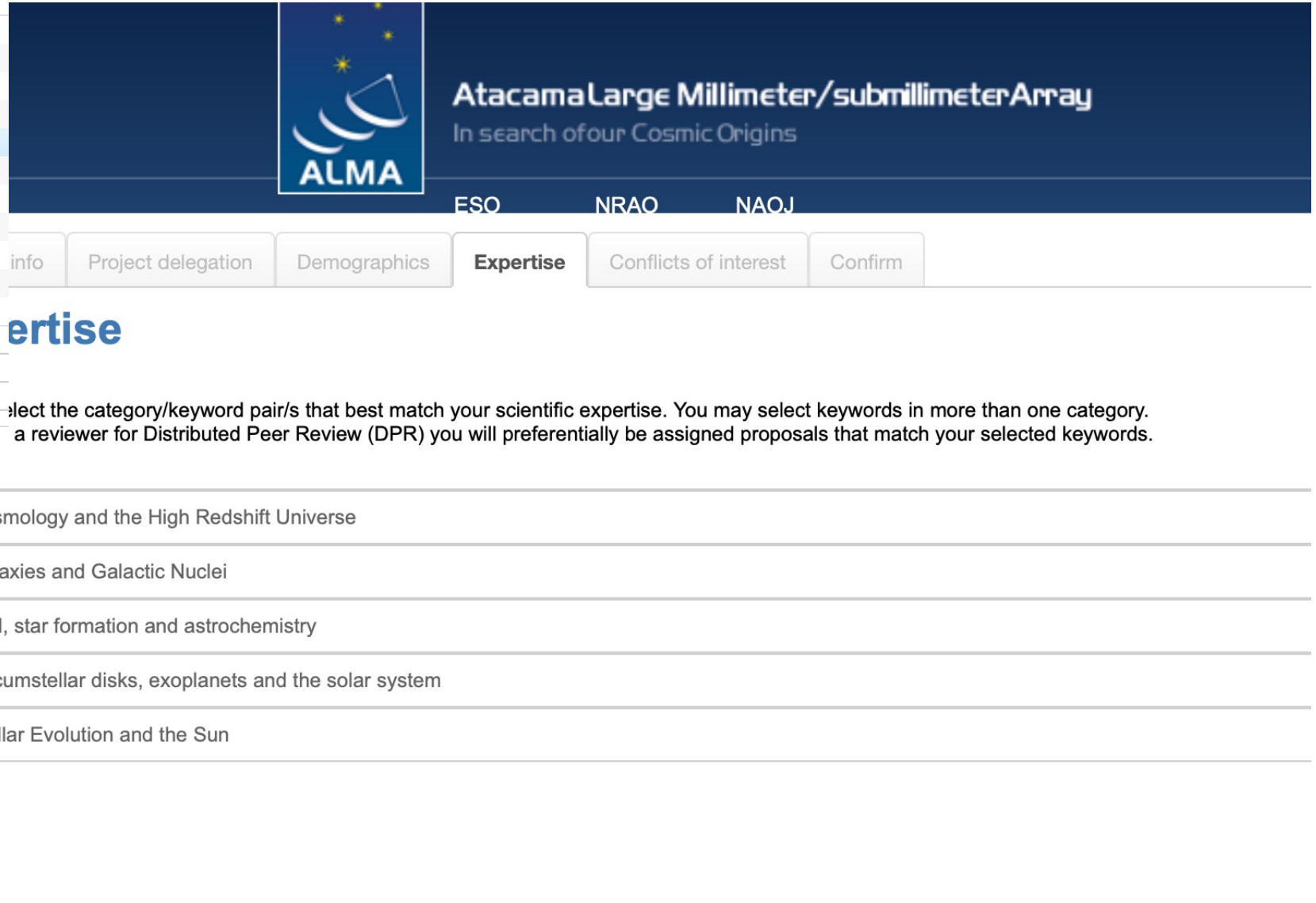


Profile: Proposal Categories



Profile: Proposal Categories





Conflicts of Interest

- In general, a reviewer has a major conflict of interest when their personal or work interests would benefit if the proposal under review is accepted or rejected.

- Close collaborators, which are defined as a substantial collaboration on three or more papers within the past three years or an active, substantial collaboration on a current project. Co-membership in a large team on its own does not constitute a conflict of interest.
- Students and postdocs under supervision of the reviewer within the past three years
- A reviewer's supervisor (for student and postdoc reviewers)
- Close personal ties (e.g., family member, partner) that are ALMA users
- Any other reason in which a reviewer believes a major conflict of interest exists

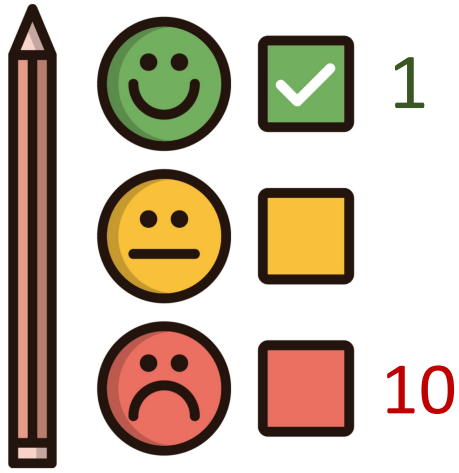
NEW

If a reviewer does not provide their conflicts, the PHT will determine conflicts based on the reviewer's proposal history for the past three cycles.

Reviewing proposals

- Review criteria
- Tips for reviewing proposals
- Writing comments for PIs

Goals of the review process



1. To establish a ranked list of all proposals assigned to you, where 1 is your top-rated proposal, and 10 is the lowest-rated proposal

When a proposal gets ranked nr 10 *does not mean* that it is not a compelling or well-justified, the ranks in this process are relative to the other proposals in the proposal set

Reviewing criteria

Overall scientific merit - focus on selecting the BEST SCIENCE

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

High risk high reward proposals

Proposals where a detection is not certain

- By its nature, ALMA invites forefront proposals that have the potential for high risk, high scientific rewards, but with no guarantee of “success” (i.e., a detection)
- For many projects, ALMA is the only option
- No other submm observatory can match ALMA’s sensitivity

Reviewers can take risks if the scientific payoff is high

Guidance for review

- Some uncertainty is necessary to advance in science
- Appropriate that the usefulness of an upper limit is justified
- Be cautious of comments along the lines “uncertain if the source will be detected

Best practices for writing reviews

First of all:

Set enough time aside for this task!

Stress and deadlines can lead to rushed deliberations and resort to shortcuts (ie. fall to unconscious bias, not rational decision based on the overall picture)

Best practices for writing reviews I

- Summarize both strengths and weaknesses
- Take care to ensure strengths and weaknesses do not contradict each other
- Avoid giving the impression a minor weakness or detail was the cause of a poor ranking
- If you can't think of clear weaknesses, do not "invent" them just to write something
- If a proposal has no significant weakness but is just less exciting than other proposals, just say so (do not specify which other proposals)

- A proposal review is NOT just a summary of the proposal
- While the reviewer may include a BRIEF (~ 1 sentence) summary, the bulk of the contents need to discuss the strengths and weaknesses of the proposal
- Restrict your feedback to the scientific aspects of the proposal : do not include comments on technical feasibility
- Comments must be based on the explicit contents of the proposal, not on assumptions about the proposing team

Best practices for writing reviews II

- Use complete sentences when writing the comments
- It is not necessary to write a lengthy review, but avoid a single sentence
- Be concise

- Do not ask questions in your review
- Questions usually indicate a proposal weakness - state the weakness directly

- Be professional, polite and constructive (how could the proposal be even better?)
- Do not use sarcasm or any insulting language
- Critique the proposal and not the PI or the proposal team

- Be aware of potential unconscious biases
- Keep your review factual and objective as possible
- Avoid using abbreviations
- Avoid comments such as “this requests a lot of time” or “expensive proposal”
- Do not use slang or jargon

Final remarks

Once you finished your reviews, read them, asking how you feel if you received them:

If you feel that they would upset you, revise them!

And keep in mind :

English may be a second language for many PIs and reviewers

Example review

Jets and outflows have been shown to be a common phenomenon during the protostellar phase, but details about the exact mechanism in the type of source proposed here are not fully known. The proposed target is very well justified and given its proximity, will provide excellent spatial resolution to study the structure of the outflow. The observations and analysis described will shed light on the physics of jet launching and accretion, leading to a better understanding of the evolution of this type of source.

However, the proposal did not adequately explain how the proposed observations will test whether the observed phenomenon is a result of the particular outflow launching mechanism or other scenarios discussed in the proposal. Also, the proposal did not adequately explain why the requested number of molecular transitions are needed for the proposed excitation analysis, compared with the pros and cons of instead observing fewer or different transitions.

Brief summary of proposal

Strengths specific to the proposal

Weaknesses specific to the proposal

Comments should indicate the strengths/weaknesses of the proposal, not the PI or the proposal team.

Technical Justification

But please check that…

Observing Tool performs (most) technical validations

Reviewers can assume that proposals is technically feasible, and that the requested sensitivity, angular resolution, largest angular scale, and correlator setup are valid and can be achieved technically.

Reviewers should evaluate if setup is sufficient to achieve science goals.

Sensitivity, Correlator setup, Largest angular scale, Angular resolution

The proposers are responsible for clearly justifying the setup with references as appropriate.

What to do if you have a technical questions during the review process

1. Send an email to the PHT pht@alma.cl

2. PHT will respond according to the checks performed by Technical Assessors at the JAO

3. Add any additional notes into the "Comments to JAO" box to help not losing track of the case.

We appreciate your expertise and your time dedicated to this collective effort!

ALMA APPRECIATES YOUR EXPERTISE AND YOUR TIME

YOU ARE CONTRIBUTING TO THE OBSERVATORY'S QUEST TO STUDY THE UNIVERSE IN THE MILLIMETER/SUBMILLIMETER WAVELENGTH RANGE.

2700 PUBLICATIONS SINCE 2012

Wishing you all a productive proposal time!

Questions? Comments?