Guidance and Tips for Writing ALMA Proposals

2024. 2. 14.

Seokho Lee (KASI)

Refereces : NAOJ, ASIAA, ESO proposal workshops.

Good Scientific Question!

Is the idea clear to you?

Has it been done already?

Else, research your idea.

Highest Priority Projects

Clicking on ALMA "Project Code" will spawn an ALI ...en no archived data exists). Clicking on the "Abstracts" or "CoIs" links will open addition...

Cycle 10 DDTs

Cycle 10

The table below lists ALMA Cycle 10 projects with p... ...ded proposals with archived observations. The public metadata includes the ALM... ...cutive to which the project is assigned (CL=Chile, EA=East Asia, EU=Europe, NA=North America, or OTHER), and the proposal science category (Category 10=Cosmology and the high redshift universe; Category 20=Galaxies and galactic nuclei; Category 31=Interstellar medium, star formation and astrochemistry; Category 41=Circumstellar disks, exoplanets and the solar system; Category 50=Stellar evolution and the Sun).

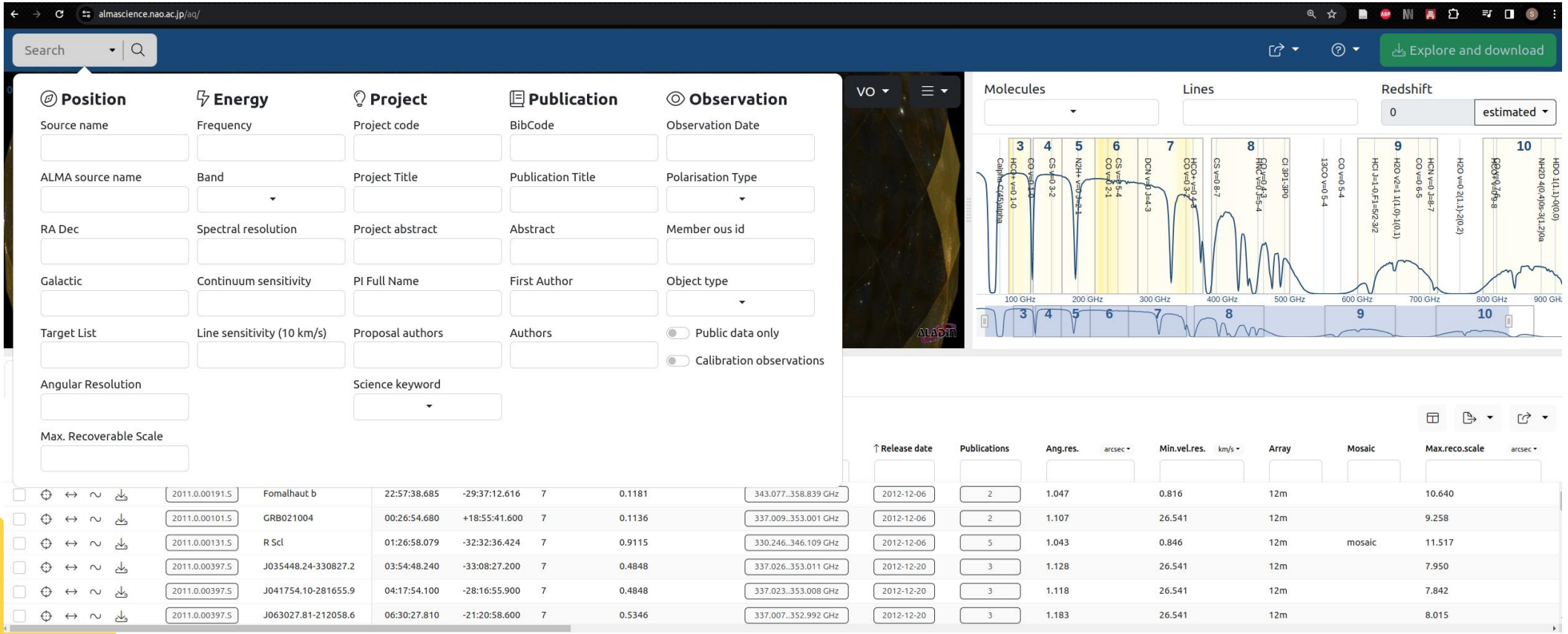
Project Code	Title (Abstracts)	PI (COIs)	Exec	Category
2023.1.00014.S	Microphysics and astrophysics at play in an assembling massive galaxy at cosmic dawn	Roberto Decarli	EU	10

Cycle 10

The table below lists ALMA Cycle 10 projects with public metadata, including all Cycle 10 A- and B-graded proposals, any Cycle 10 C-graded proposals with archived observations. The public metadata includes the ALMA Project Code, program title and abstract, investigator names and institutes, the Executive to which the project is assigned (CL=Chile, EA=East Asia, EU=Europe, NA=North America, or OTHER), and the proposal science category (Category 10=Cosmology and the high redshift universe; Category 20=Galaxies and galactic nuclei; Category 31=Interstellar medium, star formation and astrochemistry; Category 41=Circumstellar disks, exoplanets and the solar system; Category 50=Stellar evolution and the Sun).

Project Code	Title (Abstracts)	PI (COIs)	Exec	Category
2023.1.00014.S	**Microphysics and astrophysics at play in an assembling massive galaxy at cosmic dawn**	**Roberto Decarli**	**EU**	**10**
COIs	Roberto Gilli; Federica Loiacono; Fabian Walter; Emanuele Paolo Farina; Romain A. Meyer; Marcel Neeleman; Antonio Pensabene; Jessica S Sutter;			
Abstract	Understanding how the first massive black holes and galaxies grew <1 Gyr after the Big Bang is an open question of modern astronomy. The quasar PJ308-21 at z=6.2342 is the poster child of such rapid growth. The central ~1e9 Msun black hole is accreting at its Eddington limit, embedded in a galaxy with a gaseous reservoir of ~1e11 Msun that forms ~200 new stars every year. A companion galaxy is tidally stripped by, and on the verge to merge with the host galaxy of the quasar. This exceptional laboratory of galaxy evolution has been targeted with HST, Chandra, ALMA, VLT, and very recently JWST. We propose to complete this rich dataset with a sensitive search for [OIII] 88um, [NII] 122um and [NII] 205um. These three lines, together with the [CII] 158um map in hand, and the JWST data, will unveil a suite of properties of the ionized ISM: electron density, temperature, pressure, metallicity, hardness and origin of the photoionizing flux, etc. Such a wealth of information on the microphysics of the gas is new for the distant Universe, and will open a new window on our understanding of the astrophysics of galaxy assembly and growth at cosmic dawn.			

Check the Duplicate observations



You are a Reviewer!

ALMA Proposal Re

The ALMA proposal review pr bservatory (JAO). ALMA proposals are se rocess or the ALMA Proposal Review Comm

Proposals that request less tha node are reviewed using the distributed e proposal team to participate in the revie

- A scientifically ranked lis
- Individual comments for tors (PIs).

Large Programs, i.e., proposal m Array in standalone mode, are reviewe stronomical community. To gain further exp ograms, that will be considered by the APRC. T

- A list of recommended L

Proposal Review Table of Contents

ALMA Proposal Review

The ALMA proposal review process is organized by the Proposal Handling Team (PHT) at the Joint ALMA Observatory (JAO). ALMA proposals are selected by competitive peer review through either the distributed peer review process or the ALMA Proposal Review Committee (APRC).

Proposals that request less than 50 h on the 12-m Array or less than 150 h on the 7-m Array in standalone mode are reviewed using the distributed peer review system, in which the proposal team designates one member of the proposal team to participate in the review process. The outcomes of the distributed peer review process are:

- A scientifically ranked list of proposals
- Individual comments for each proposal written by the reviewers that are sent to the Principal Investigators (PIs).

Large Programs, i.e., proposals that request more than 50 h on the 12-m Array or more than 150 h on the 7-m Array in standalone mode, are reviewed by the APRC, a panel composed of experts selected from the international astronomical community. To gain further expert assessment, external Science Assessors will provide reviews on Large Programs, that will be considered by the APRC. The outcomes of the APRC review process are:

- A list of recommended Large Programs
- A consensus report for each Large Program that summarizes the strengths and weaknesses of the proposal.

All proposals are reviewed in a dual anonymous fashion in which the proposers do not know the identity of the reviewers and the reviewers do not know the identity of the proposers. All proposals need to be prepared in accordance with the dual-anonymous guidelines.

Proposal Review Table of Contents

Guidelines for Reviewers

Review criteria

Each proposal contains a cover sheet, a Scientific Justification, and a Technical Justification. Reviewers need to read each of these sections. Note in particular that the Technical Justification often contains a detailed justification of the requested sensitivity, angular resolution, and correlator setup that will be useful in evaluating the proposal.

Reviewers should assess the scientific merit of the proposals to the best of their ability using the following criteria:

The overall scientific merit of the proposed investigation and its potential contribution to the advancement of scientific knowledge.

- 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? ALMA encourages reviewers to give full consideration to well-designed high-risk/high-impact proposals even if there is no guarantee of a positive outcome or definite detection.
- Does the proposal clearly describe how the data will be analyzed in order to achieve the science goals?

The 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 and well justified?
- Does the proposal justify why new observations are needed to achieve the science goals?
- For Joint Proposals (see Section 3.5 in the Proposer's Guide), does the proposal clearly describe why observations from multiple observatories are required to achieve the science goals?

You are a Reviewer!!

- Reviewers firstly check the **signifiace of question/goal** and the **feasibility of its strategy**. Then, they will try their best to find weakness and reject proposals:
  - “Any unanswered question is immediately considered as weakness. DO NOT give the reviewers easy-to-identify weakness!” – Nick

You are a Reviewer!!

- Reviewer will need to read 10+ proposals.
- A nice-looking proposal is always helpful (on the basis of good science).
- Not all reviewers know your field, so make the proposal understandable and put your science into context.
  - Non-experts have to be able to read your proposal.
  - Experts have to be able to apprciate your proposal.

Review Criteria

Review Criteria (I): Scientific merits

- Does the proposal clearly indicate which important, outstanding questions will be addressed?
  - What is the general background of the field?
  - What are the open questions (three at most) in this field? Why are they important?
- Will the proposed observations have a high scientific impact on this particular field and address the specific sicence goals of the proposal?

Review Criteria (I): Scientific merits

- Why your project matter?
- Why is this proposal more important than the other proposals?
- Is it leading a breakthrough or just being increamental?
- Is it testing the problem or challenging the previous understanding from a new aspect?

Review Criteria (II): Feasibility

- Does the proposal clearly describe how the data will be analyzed in order to achive the science goal?
  - What analyses will be done once get the data?
    - Compare with any models/simulations?
    - Use any dedicated tools?/ Assumptions are valid?
    - How to deal with null results? / What can be done in the case of negative results?

Review Criteria (III) : Suitability

- Is the choice of target (or targets) clearly descriebed and well justified?
  - How the targets are selected? Is the sample size big enough?
- Are the requested SNR, angular resolution, largest angular scale, and the spectral setup sufficient to achive the science goals and well justified?
  - Why you choose these values clearly?
- Does the proposal justify why new observations are needed to achieve the science goals?
  - Why ALMA is needed?

Tips

Proposal

- Abstract (<1200 characters)
- Science Justification (4 page)
- Technical Justification (in OT)

Tips : (Title +) Abstract

- Hopefully short: what is the problem and how to solve it (not a long abstract that can sound as an introduction). The abstract will give the first (hopefully good) impression to the referees.

@ Impellizzeri's slide

Tips : Abstract

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

Abstract should convey these elements, but the order can vary. Many PIs start with "We propose…"

Tips: Abstract

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

Science Justification

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

- **Introduction (1 page)**
  - Big picture
  - Specific problem to be solved
  - Previous work and unsolved issues.
  - Summary of what your propose to do
- **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 page)**
  - Key points only : refer to technical justification for details

TIPS: Introduction

- Motivation : What is the big picture and why is it important?
- Specific problem : What problem are you going to solve?
- Context : Why cannot previous work solve the problem?
- Objective : We need to measure ....
- Strategy: In this proposal, we will

Tips: Introduction

- Short introduction on the gernal topic and quickly go to introduction necessary to understanding the scientific questions (motivation). Delineate here which have been the problems that keep the research questions unresolved and motivate how ALMA can overcome these problems.
- Make the scientific motivation clear by numbering 2-3 questions that MUST BE addressed later in the proposal.
- Get to the point quickly. Do not begin the proposal by providing an extensive (1+ page) discussion of background material. State the primary goal of your proposal on the 1st page, preferrabley in the top half.

Tips: Goal/Question

- Good : Yes/No
  - Is the magnetic field dynamically important compared to turbulence and gravity?
    - Later in the proposal: The magnetic field strength will be estimated by using … And the different energies will be compared by doing ….
- Bad : What are the initial conditions of high-mass star formation?

Tips : Big picture science

- We very often find an interesting source and want to keep studying it as much as we can. However, it may not call the attention from anyone else.
- It is important to find a strong motivation and convince other people that the study we have in mind is worth doing
- So, it is very important to put our project/idea in broader context to motivate other scientists (and be awarded observing time).

Tips: Methorogy

- How will you analyze the data?
  - Describe the analysis techniques/models
  - ALMA/CASA simulations are often useful
  - Demonstrate that the team is strong to carry out the project
- Expected results and impacts
  - Common (and successful) formula:
    - Observe X → prefer model A
    - Observe Y → prefer model B
  - What can be done in the case of negative results. Explain the implication of an upper limit and why it is important

Tips: Methorogy (Targets)

- Why is this the BEST source(s) to observe to achieve the science goals?
  - Closest, biggest structure to provide the best spatial resolution?
  - Brightest, to provide the best SNR?
  - Unique?
  - Weath of ancillary data?

Tips: Methorogy (Survey)

- List clear, explicit selection criteria.
  - We select all sources in Taurus
    - Brighter than 10 mJy in the continuum and
    - Spectral types between M6 and M9 and
    - No known binry companion
- Justify the sample size!
  - 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 by a lot (e.g., 10 times more objects)

Tips : Methology (Immediate objectives)

- What exactly will be done to answer the questions mentioned in the introduction. And end your proposal one of the two major points.
  - “By prefoming X observations, we will achive Y.”
  - “By answering question X, we will gain a better understanding of process Y, which has important implications for subjects A, B, and C.”

Tips : 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.

Technical Justification: 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
  - Use ALMA time in the most efficient way

Additional Tips

Tips : Highlight the important points

- Emphasized text (Boldfaced, underlined, italicized, bulleted list, or font colors) can and should be used, but only with purposed, and sparingly (the more emphasized text there is the less important it become)
- limit the use of emphasized text to 2-3 sentence that describe:
  - The main scientific goal of the proposal
  - The importance of this research in broader context.
  - The observations to be performed.
- This practice helps the reviewer

Tips: Figure

- Polish the plots, do not just cut and paste from your papers.
  - Details (e.g., contours) should be clear enough.
  - Use arrows and labels to guide reviewers' eyes.
  - Always have scale bars for sky maps
  - Clear and concise caption.
  - Use color-blind/bw-printer friendly color maps.

Tips: Figure

- Anything appearing on your figure should be readable and understandable. The best is that people can pick up most of the ideas without reading into the caption.
- Use proper font sizes in the labels
- One figure should convey only one or two ideas at most. If you have many points to make, create more figures.
- If your are making a contour plot, do not entangle the contours of multiple images. Usually, I would not consider presenting more than 2 images in a contour plot.
- Do not have a big blank space in your figure. Take advantage of all of the space you can use.
- Try various color-codings or color-maps until your figures appears as a nice designed work.

Tips:

- Use active voice when possible
  - We will determine Y (O) vs Y will be determined (X)
    - As long as you never stat who “we” are, then the proposal is still anonymous
  - Do not say something like “ our previous observations suck and therefore we need new data.” Say “ the new observation will make improvement over the previous one in this and that sense.”.
  - Be quantitative as far as possible (e.g., you are making the observation deeper by a factor of X.)

Tips

- Start early (~2 months)
  - Thinking the idea for a long time and discussing with collaborators about it (before writing the proposal) really helped you.
  - This gives you time to be up to date with bibliography as well.

Tips

- Write the first draft as soon as you have a concreate idea (~1 month)
  - Most collaboators are to busy before the deadline and most of comments will be superficial.
  - Ask a friend that works other field to read the proposal,

Anonymous:
Proposal should not reveal the proposing team

- Do not list the PI, co-Pis, or co-Is anywhere in the proposal.
- Reference your own work in the third person
  - In Smith et al (2018), we demonstrated… (X)
  - Our study (Hayashi et al. 2021) showed that … (X)
  - As demonstrated in Smith et al. (2018), … (O)
  - Hayashi et al (2021) showed that… (O)

Anonymous:
Proposal should not reveal the proposing team

- Figure 1 shows the CO image of the cloud from Gomez et al (in prep. /submitted) (X)
- ..(private communication) (O)

Anonymous:
Proposal should not reveal the proposing team

- Do not name the PI when listing a project code, even if it is not your own project.
  - .. The image from Cycle 7 program (2019.1.0245.S, PI: xxx) (X)
  - ...(2019.1.0245.S) (O)
  - if it is not open yet, it should use (private communication)

Format of 2nd Meeting:

Abstract

- Background (big ficture)
- Problem
- Objective
- Strategy
- Significance

Scientific Goal (Introduction)

- What is your goal or question? (1 sentence)
  - Can the proposed observation provide answers to this question?
  - Can the question be determined through the observation as Yes/No judgment?
- What is the big picture and why is this question impartnat?

Methorogy

- What source to be observed?
  - There are likely many proposals on a similar topic. Among them, why this proposed observation is the best strategy to address the issue.
- How will you analyze the data? How to answer your question based on the observed data?
  - Expected results and impact
  - If non-detected, what is the meaning?
  - Immediate objectives: Inducible quantities from observed data.

Technical Justification

- Angular resolution, Largest anular scale, sensitivity, correlator setup.
- Are they the best to achieve the science goals.
- Contact ARC member if you need help.

Send the pdf file due to 2/25 (Sunday)