Tips for writing ALMA proposals

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References

- https://almascience.eso.org/tools/eu-arc-network/i-train **I-TRAIN #13: Writing & Reviewing ALMA Proposals**
- https://www2.nao.ac.jp/~eaarc/Meetings/ALMA_PPM2020_stop/ProgramPPW8.html
- And many tips from onlines

Good Scientific Question!

- Is it important in your field? (Big Picture!)
- is it clear? (Yes/No question)
  - is it determined by the proposed observation?

- **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?

Has it been done already?

- Read the literatures (ADS)
  - https://ui.adsabs.harvard.edu/
- Read abstracts of accepted proposals
  - https://almascience.nao.ac.jp/observing/highest-priority-projects
- Search ALMA archive
  - https://almascience.nao.ac.jp/aq/

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 additional fields in the table with the corresponding metadata.

Cycle 11 DDTs

Cycle 11

The table below lists ALMA Cycle 11 projects with p…led proposals with archived observations. The public metadata includes the ALMA Project Code, program title and abstract, investigator names and institutes, the Executive to …a, 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
2024.1.00006.S	Resolving the base-part of AGN-driven ionized outflows by using a submm recombination line	Takuma Izumi	EA	20
2024.1.00012.S	CN Zeeman experiment toward a massive star-forming region	Manuel Fernandez-Lopez	OTHER	31
2024.1.00015.S	SMM J0658: Probing Star-Forming Clumps and PDRs in a Highly Magnified ISM at z~3	Carla Cornil-Baïotto	CL	20
2024.1.00019.T	H2O maser variability during the super maser flare in Orion KL	Tomoya Hirota	EA	31
2024.1.00025.S	Studying CO SLEDs of local LIRGs at 100 pc resolution	Loreto Barcos-Munoz	NA	20
2024.1.00027.S	Wind of Change: Temporal Variability of Titan's High-Altitude Circulation System	Martin A Cordiner	NA	41
2024.1.00028.S	Beholding Massive Star Cluster Formation and Evolution with the "Evil Eye"	Jiayi Sun	NA	20
2024.1.00029.S	A complete view of the molecular ISM in distant main sequence and starburst galaxies from CO+[CI]	Francesco M. Valentino	EU	20

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almascience.nao.ac.jp/aq/

Search

Download

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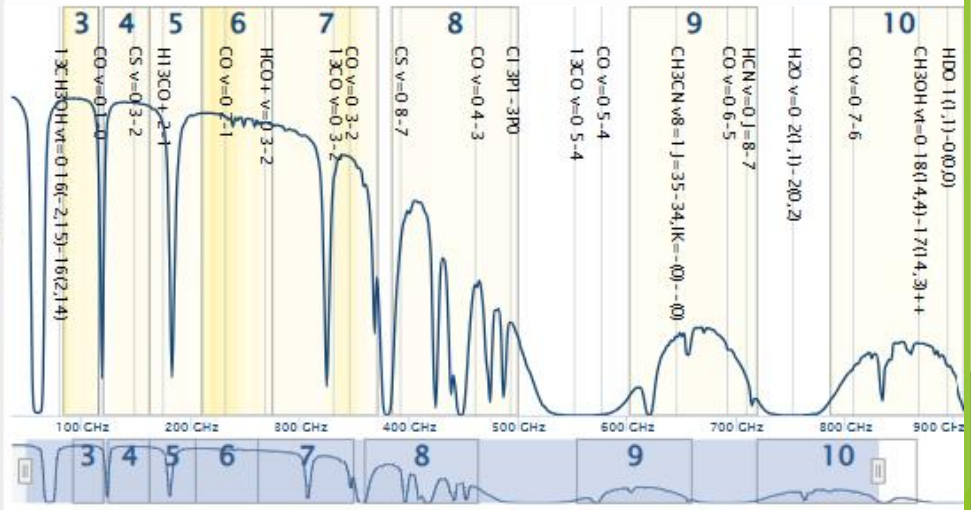
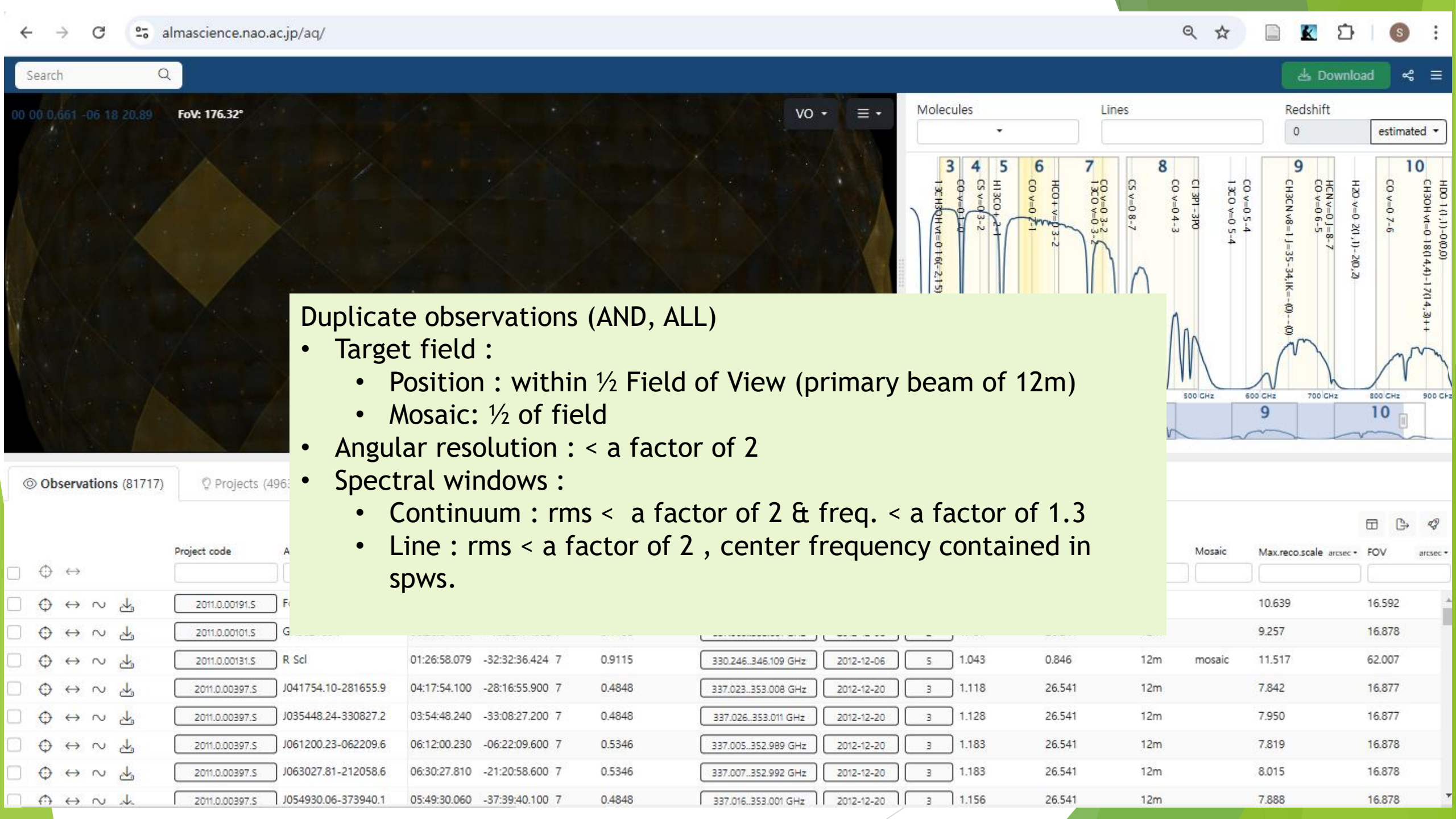
VO



Observations (81717) Projects (4963) Publications (4050)

Project code	ALMA source name	RA hms	Dec dms	Band	Cont.sens. mJy/beam	Frequency support	Release date	Publications	Ang.res. arcsec	Min.vel.res. km/s	Array	Mosaic	Max.reco.scale arcsec	FOV arcsec
2011.0.00191.S	Fomalhaut b	22:57:38.685	-29:37:12.616	7	0.1181	343.077..358.839 GHz	2012-12-06	2	1.047	0.816	12m		10.639	16.592
2011.0.00101.S	GRB021004	00:26:54.680	+18:55:41.600	7	0.1136	337.009..353.001 GHz	2012-12-06	2	1.107	26.541	12m		9.257	16.878
2011.0.00131.S	R Scl	01:26:58.079	-32:32:36.424	7	0.9115	330.246..346.109 GHz	2012-12-06	5	1.043	0.846	12m	mosaic	11.517	62.007
2011.0.00397.S	J041754.10-281655.9	04:17:54.100	-28:16:55.900	7	0.4848	337.023..353.008 GHz	2012-12-20	3	1.118	26.541	12m		7.842	16.877
2011.0.00397.S	J035448.24-330827.2	03:54:48.240	-33:08:27.200	7	0.4848	337.026..353.011 GHz	2012-12-20	3	1.128	26.541	12m		7.950	16.877
2011.0.00397.S	J061200.23-062209.6	06:12:00.230	-06:22:09.600	7	0.5346	337.005..352.989 GHz	2012-12-20	3	1.183	26.541	12m		7.819	16.878
2011.0.00397.S	J063027.81-212058.6	06:30:27.810	-21:20:58.600	7	0.5346	337.007..352.992 GHz	2012-12-20	3	1.183	26.541	12m		8.015	16.878
2011.0.00397.S	J054930.06-373940.1	05:49:30.060	-37:39:40.100	7	0.4848	337.016..353.001 GHz	2012-12-20	3	1.156	26.541	12m		7.888	16.878



Duplicate observations (AND, ALL)

- Target field :
  - Position : within ½ Field of View (primary beam of 12m)
  - Mosaic: ½ of field
- Angular resolution : < a factor of 2
- Spectral windows :
  - Continuum : rms < a factor of 2 & freq. < a factor of 1.3
  - Line : rms < a factor of 2 , center frequency contained in spws.

Can it be solved with Archival data?

- quantitatively demonstrate that your idea cannot be done with the archival data (or accepted proposals)
- Reviewers will ask the same question and why do you need to get new data?.

Has it been done already?

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- Search ALMA archive
  - https://almascience.nao.ac.jp/aq/

How to find Ideas

- Read the literatures (ADS)
  - https://ui.adsabs.harvard.edu/
- Read abstracts of accepted proposals
  - https://almascience.nao.ac.jp/observing/highest-priority-projects
- Search ALMA archive
  - https://almascience.nao.ac.jp/aq/
- **Accepted proposals in other telescopes**
  - **JWST, VLA, Keck**

Think as Reviewers and help them

- Reviewers firstly check the **significance 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
- Reviewers are Non-experts (~50%) and experts (~50%)
- Make the proposal be easy to read and to find the check points.
  - Although the check points are mentioned in the proposal, reviewers sometimes overlook them.

Proposal: masterplane of paper

- Introduction:
  - issues in the field / unresolved problem by previous observations
- Observations
- Analysis / Results
- Discussion (impact of this observation)

Review Criteria

https://almascience.nao.ac.jp/proposing/alma-proposal-review/guidelines-for-reviewers

Scientific Merits / Feasibility / Suitabilty (+ Efficiency)

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?

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?

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?

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 (**lines, bands**) 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?

Efficiency

- Shorter Observing Time
- More compact configuration (C1,C2, ..)

Proposal Components

- Abstract (<1200 charactors)
- Science Justificaiton (4 pages)
- Technical Justificaiton (in OT)

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…”

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!)

(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.

Science Justification

- **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

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

Science Justification: 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

Science Justification: 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.**

Science Justification: Methorogy (Target)

- 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?

Science Justification: 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)

Science Justification: 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

Science Justification: Methorogy (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.”

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.

Technical Justication

- 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

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

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.

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.

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.)

Thank you!