Tips for Writing a Successful ALMA Proposal

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I have to collect data for myself, my students, etc.

I damn hate proposal writing.
Therefore, I do it efficiently.

The following talk is mainly based on experience. There is no guarantee that my suggestion will help to any extent.

My Records

PI of 15 accepted ALMA proposals

Co-I of 98 accepted ALMA proposals

(Number of my participated proposals can be roughly estimated based on the over-subscription rate. I have failed proposal**s** too.)

I have been active in three science categories (with journal publications):

20: Galaxies and galactic nuclei

31: Interstellar medium, star formation and astrochemistry

41: Circumstellar disk, exoplanets and the solar system

SMA-T TAC chair in 2020-2022

ESO Fellow selection committee member in 2017

What is Essential?

1. Novelty (observing time is expensive. Why your project matter? Would the requested observations worth a good journal publication? **Is it leading a breakthrough or just being incremental**? Is the project just getting your supervisor one more citation, or it is testing the problem or challenging the previous understanding from a **new aspect**? Give yourself specific and concrete answers about these questions before proceeding to the next step. If you cannot do it, it is already too late, unfortunately. You should have discussed with your colleagues or supervisor more frequently and constructively.)

2. Solidness (This sometimes conflicts the previous point, e.g., there can be high-risk high-reward projects that can be exploratory. Otherwise, it could be a designed experiment to constraint certain fundamental physical parameters such as fine-structure constants, or to verify/falsify certain relevant astrophysical models. The bottom line is the terms have to be well-defined.)

3. Self-consistency (i.e., no loop hole in the logic)

Preparing an ALMA proposal will cost you and your colleagues very significant time. If you just want to try some observations but do not know how it matters, think again ~~or go to SXA~~. Do not bring up something that does not matter when everybody is busy.

The proposal can be doomed by receiving just one bad grade from the 10 reviewers.
You have to <u>**make**</u> **<u>EVERYONE</u>** <u>**happy**</u>.
<u>That is the difficulty</u>.

Non-experts have to be able to read your proposal. Experts have to be able to appreciate your propsal.

Start Early

Usually, you need to polish your important proposals many times. And sometimes you need to sit on your draft for days or weeks before coming back to polish it with refreshed eyes/mind.

When you are junior, **be REALLY EARLY**!

Your supervisor(s)/collaborator(s) need to take care of their own proposals and other collaborations when the deadline is approaching.

(help your supervisor(s)/collaborators. Use Grammarly or ChatGPT to clean up the typos and grammatical errors before sending to them.)

Use a Positive Tone

Do not say something like "our previous observations suck and therefore we need new data".

Say "the new observations will make improvement over the previous ones in this and that sense". And be quantitative as far as possible (e.g., you are making the observations deeper by a factor of X).

Avoid Jargon

If you do not have a sense of what is jargon, ask your friends who are not in the same research field to proofread your proposal.

Also, do not use too many acronyms (e.g., FRVF of SBUhzMSMBHs for Faraday-Rotation variational frequency of submillimeter bright ultra high redshift merging super massive black holes... this is too much for me. Do some thinking to help your reader by simplifying the writing). For people who <u>cannot remember</u> or <u>do not want to memorize</u> the actual meanings of the acronyms, your proposal will become **unreadable**.

Spend Time Preparing Nice Figures

1. Anything appearing on your figure should be readable and understandable. The best is that people can pick up most of the ideas <u>without reading into the caption</u>.

2. Use proper font sizes in the labels.

3. One figure should convey <u>only one or two ideas at most</u>. If you have many points to make, create more figures.

4. If you 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.

5. Do not have a big blank space in your figure. Take advantage of all of the space you can use.

6. Try various color-codings or color-maps until your figure appears as a nice designed work. Avoid using the saturated default RGB if possible.

Make it Smooth

Test your friend: after reading your proposal for 5-10 mins, what do they remember?
In the distributed ALMA review, the reviewers are not too different from them.

The text and figures are not *a stack of information*. They should not just being there. Make your **design**.

The information should be displayed in a way that people can pick up and **remember** **the most important points smoothly**.

Place figures at the right page such that people will naturally see it when you are referring to it. Avoid letting people check back and forth your paragraphs.

The logic should be one-way instead of a loop, or loops.

A member in the review panel may have 30~50 proposals to read, grade, and compose feedback comments. Many people I know try to accomplish this task in 2 working days (i.e., 16 working hours) since it is very painful. In the initial screening, you only have their **5~10 minutes** to read your 2 pages text plus 2 pages figures and tables.

Do Not Assign Homework to the Reviewers

If it requires checking some specific references to understand your proposal, your proposal is doomed. This is not what ideally should happen. But this is the reality, unfortunately.

Nobody will ever read into any reference you provide.

To some extent, the references are to show that you are familiar with the recent development.

You should not attempt to educate the reviewers with the references.

Tailor Your Proposal for the Prospective Readers

For example, if you know people in a certain big consortium are going to review your proposal, then do not attack their work in a bad way (e.g., The XX consortium make a unbiased direct imaging survey for exoplanets. Unfortunately, they detected nothing or nothing new).

The deficiency of a previous project is often our motivation to propose a new one. But rephrase (e.g., The XX LP has provided a stringent upper limit to OO. In this work, we change the survey strategy to specifically improve the constraint(s) on WW).

Make a Balance Between Humbleness and Confidence

Do not over-advertise your work. If you say your experiment will win a Nobel prize, the reaction of most of the readers will be "Oh yeah?", and then start to challenge every single point you made.

But also do not say something like "Our previous experiments suck". Everybody knows that Asians tend to say so, but they never actually calibrate this culture difference.

Be Honest

Do not propose what you are not going to do.

(Come on, it is already Cycle-10. Winning a proposal is not that important anymore. Doing excellent science is.)

When you already know that a specific assumption is unrealistic, or when you do not know whether or not a specific assumption is unrealistic, do not make that assumption. You should be able to justify your assumption based on some physical principles or observational evidence, even if you do not have space to explicitly justify them. "It is the best we can do" is not a good excuse for making an unrealistic assumption. It sounds bad to some of us.

Do not propose the analyses that you already know is unfeasible It can happen that you only know your experiment is unfeasible during the preparation of your proposal. In this case, terminate the project. Be very careful when you are proposing an experiment that you are not certain about whether or not they are feasible or relevant. Sometimes you do not actually know the feasibility before you receive the data (e.g., when you try to propose the first blind search for exoplanets). Some of such experiments are in the high-risk high-reward category. But you should at least have some justifiable ideas in mind why it might be feasible. It is OK to try it, perhaps, starting from a de-scoped pilot study.

Be honest to yourself. Do not pretend that you do not yet know whether or not it will work out when you are already convinced that it is not going to work.

What Usually Happened to Me

It seems worse than random.

The best proposal gets the worst grade. This becomes more serious in the era of distributed review. This is particularly bad when you are trying to do something that is unique or technical advanced.

I still don't find a good solution to this problem.

Excellent (e.g., approved) proposers may or may not be good reviewers for every proposal. The remaining 75% of proposers may give everybody some surprises...

The SMA TAC with experts and a chance to discuss among the experts clearly make some difference.

What I Usually Do

1. Pretend that I am composing the introduction section of a proto-paper. I usually really copy-paste my proposal to a paper.

2. Take proposal-writing as an opportunity to prepare your publication-level figures for the ongoing work, as far as possible.

3. Take proposal preparation as an opportunity to make deep communication with colleagues in the world. It often kick-off some studies that can base on existing data, or kick-off some theoretical studies.

4. Read papers to extend my knowledge base and skill sets.