Proposal Preparation Tips

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0. Outline

1. General tips

2. Accepted case I
Provided by Dr. Jongho Park .

3. Accepted case II
Provided by Dr. Bumhyun Lee.

4. Accepted case III
My case supporting the tips above.

4. Summary

These are a summary of "ALMA Proposal Workshop" held at KASI in 2023 and 2024 winter for students.
https://alma.kasi.re.kr/

1. General tips — start, duplication, capability

Just in case you haven't finished these steps yet...
- Start early (>1 month before).
- "almascience.org" → Observing → Highest Priority Projects
- "almascience.org" → Documentation
- OT → Control and Performance → Planning and Time Estimate

Reviewers ask why you need new data?

1. General tips — title, abstract

With concise questions and solutions, excite the reviewers!

[Example of abstract structure]

Background
Problem
Objective
Strategy
Significance

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.
Proposal 2019.1.00061.S, PI: Richard Ellis

1. General tips — Impressions of a man

An intelligent, industrious, impulsive, critical, stubborn, envious man.
→ Stubborn/impulsive impresses that he knows what he means. 👍
→ Intelligent/industrious is attributed to critical/envious. 👍

An envious, stubborn, critical, impulsive, industrious, intelligent man.
→ Envious/impulsive impresses that he is maladjusted. 🚫
→ Envious/stubborn restricts Industrious/intelligent. 🚫

S. E. Asch 1946, *The Journal of Abnormal and Social Psychology*, 41, 258

The initial contents can determine how to interpret the following contents.

1. General tips — background, introduction

A structured section, showing key points, is preferred at the start.

Motivation: What is the big picture? Why is it important?
Question: What problem are you going to solve?
Context: Why can't previous work solve it?
Objective: We need to measure…
Strategy: In this proposal, we will…

All the questions here must be addressed later in the proposal.
Don't provide a heavy discussion of background material.

1. General tips — big picture, goals, objectives

🚫 Want to observe interesting sources I found.

👍 → Aim to determine if this initial result is a representative indicator of when galaxies first emerged.

🚫 What are the initial conditions of high-mass star formation?

👍 → The form of "A (yes)" or "B (no)".
Which is more important, magnetic field vs. turbulence?
Then later, the magnetic field strength will be estimated by using... It will be compared with the turbulence by doing...

1. General tips — methods, targets, TJ

- Analysis, techniques, models, ALMA simulation
- Expected results and impacts: e.g., the result X prefers model A.
- In the negative case, an upper limit and its importance, for example.

Individuals: closest, largest, brightest, unique, wealth of ancillary data
Survey: all sources brighter than 10 mJy, 20 sources allow 10% accuracy of an index, 10 times more than the previous survey.

- Sensitivity, angular resolution, MRS, velocity resolution, line, continuum.
  Also, why not NOEMA, SMA, VLA, etc. but ALMA?
← Easily pointed out by reviewers if you forgot justifying any of them.

1. General tips — figure, writing, anonymity

Figures:
Arrows and labels inside a figure. No big blank.
Concise caption, but the figure's idea should be conveyed without the caption.
One figure should convey only one or two ideas at most.

Writing:
Use active voice when possible: We will determine Y.
🚫We need new data because our previous observations are not good.
👍The new observation will improve this point from the previous observations.
Be quantitative: e.g., by a factor of 3.

Follow "Dual-Anonymous Guidelines" (and Guidelines for Reviewers).

2. Case I — Unique technique

Title: Probing the Magnetic Fields in the Jet Base of the Gamma-ray Bright Blazar PKS 1510-08.

Requested time: 3 hours

Bands: 4 (150 GHz), 6 (230 GHz), 7 (345 GHz)

Special Requests:
Earth-rotation Polarimetry. ←Unique!
(This makes multi-band pol. possible in a short time.)
Student project.

$$\frac{XX - YY}{XX + YY} = \left(\frac{PI}{I}\right) \cos 2(\chi - \psi(t))$$

2. Case I — Clear outcome

Accretion Flow Emission-Dominated model

86 GHz   230 GHz   345 GHz

Tick unit: uas

Jet Emission-Dominated model

86 GHz   230 GHz   345 GHz

Objective: First multicolor view of the black hole environment in M87

Accretion vs. Jet ←A vs. B!

←Prediction visualized!

←Distinguishable scenarios!

ALMA-VLBI at Band 7 started in this cycle (Cycle 9)
←Unique technique

2. Case I — Graveyard behind success

Project: observing NGC 315 with global mm-VLBI including ALMA
The main scientific objective is to investigate the edge-brightening of the jets at the innermost scales.

- 2021, Cycle 8, rejected
- 2022, Cycle 9, rejected
- 2023, Cycle 10, rejected
- 2024, Cycle 11, accepted!

Between Cy10 and 11, VLBA and GVA results suggested the edge-brightening on a large scale.

Park et al. (2024, ApJL)
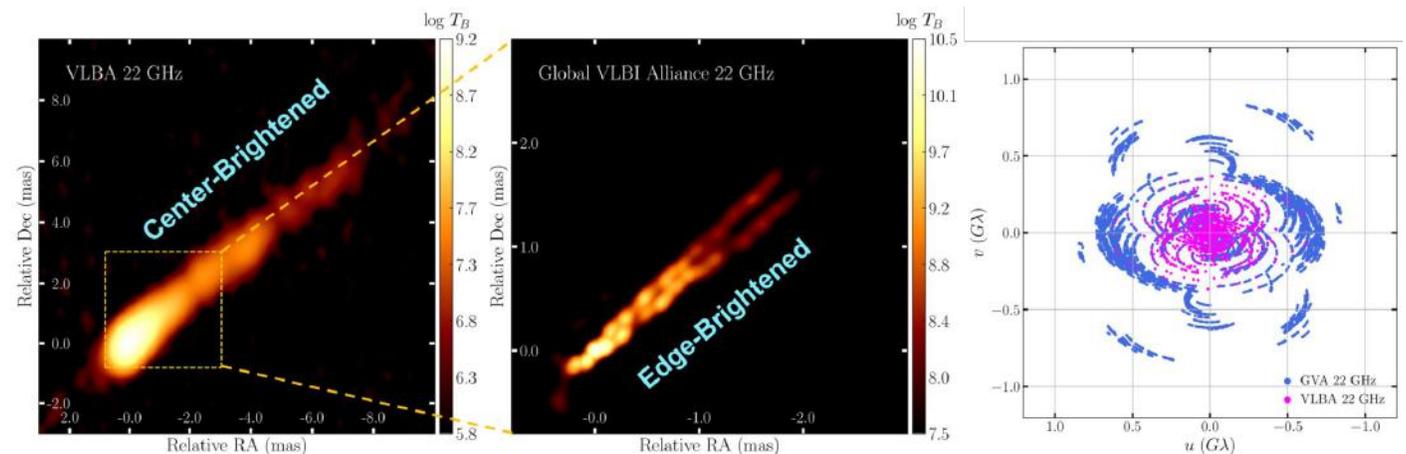
3. Case II – Justification from big picture

Big picture
To reveal the effect of group environment on molecular gas and SF activities of galaxies. ← Ambitious!

Objectives
(1) Morphological correlation between ACA CO and HI → whether environmental processes can change the distribution of both CO and HI.
(2) Relationship between the SFR surface density (UV) and the gas surface density (CO) → whether group and field galaxies follow the same SF mode.

Targets
Resolvable down to sub-kpc, late-type galaxies, $M_* = 10^9 - 10^{11}$ Mo, within $1.5 \times R_{vir}$ and $3 \times \sigma_v$. ← Quantitative!

3. Case II — Advantage of ancillary data

Multiwavelengths are used for a comprehensive understanding of the physical properties of galaxies.

- Molecular gas (ALMA)
- HI gas (ASKAP/VLA)
- Stellar component (optical & IR)
- Star formation activity (Hα, UV, IR)

3. Case II — Here is also a graveyard

Dr. Bumhyun Lee continuously tried the same proposal reflecting the reviewers' comments.
- The original proposal in Cycle 8 2021 → declined
- Retry based on the review in Cycle 8 2021 Supplemental Call → declined
- Retry based on the review in Cycle 9 → accepted

Accepted proposals are often declined before their success.
Keep modifying your proposals (*not only minor changes*) and trying!

4. Case III — History of one of my proposals

Protostars
in Taurus
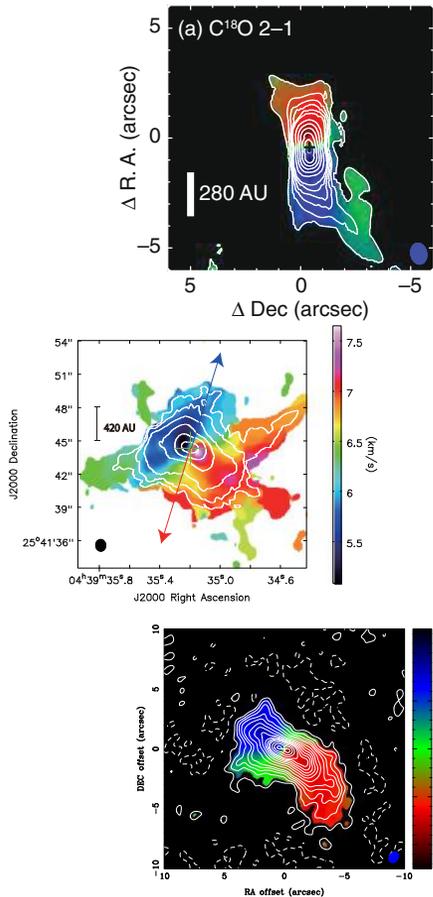
Extension to the
south, young region
Serpens Main
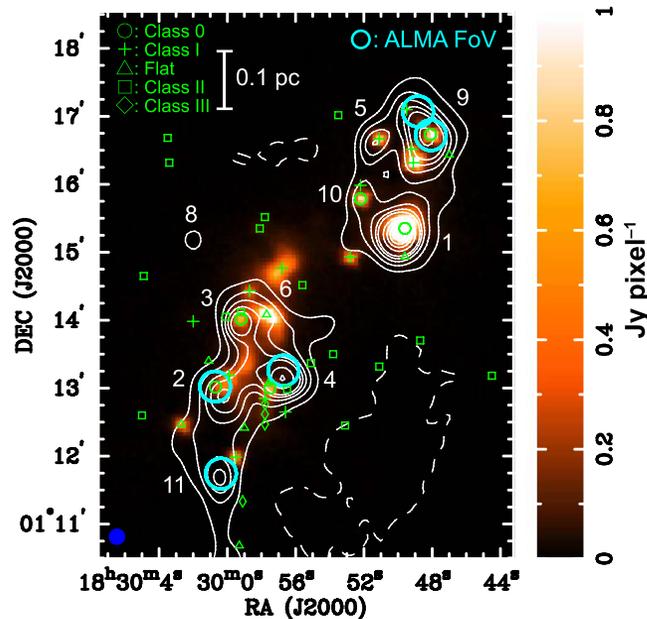
- Class 0 with outflows
- Compact, no outflow
- **Starless**

  Turbulence vs. gravity for
  multiple/binary formation.

Declined.
The main weakness seems a
vague link to understandings
of the whole star formation.

4. Case III — Power of idea

Dr. Changwon Lee kindly showed his interest when I presented this result at a seminar in KASI. He pointed out that their low fluxes suggest very low core masses. Then he said,

"They must be pre-Brown-Dwarf cores."

(a) Pre-BD can acquire mass and thus grow.
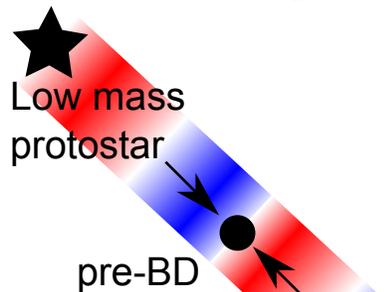
(b) Protostars rob mass for pre-BD

Low mass protostar

pre-BD
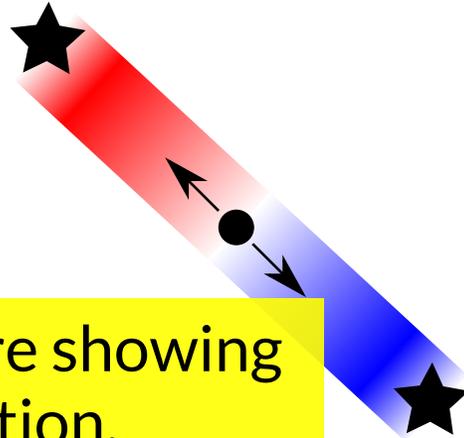
Tailored figure showing "A or B" question.

Strengths for bad scores sound more specific than for good scores.
→ Finding specific strengths does not change reviewers' impressions better.
Need a good first impression.

4. Case III — Graveyard...

Cycle3 — Taurus to Serpens[B]
Cycle5 — Serp follow-up
Cycle6 — Serp follow-up, Three in Serp,
        Pol. in TMC-1A (Taurus)[B]
Cycle7 — Pol. in a Serp outflow[B], Class 0 in Serp,
        Prestellar in Serp, Compact in Serp
Cycle8 — Prestellar in Serp[B], Binary in Serp,
        TMC-1A pol. follow-up
Cycle9 — TMC-1A pol. follow-up, Streamer in eDisk
Cycle10 — TMC-1A pol. follow-up, Streamer in eDisk,
        Multi-band in TMC-1A
Cycle11 — TMC-1A pol. + multi-band, Streamer in eDisk

Resubmission is excluded.
[B]Accepted B rank.

7 related failures.
~4 proposals/yr
including resubmission.

→ Don't let failure
discourage you!

4. Summary

✓ Official documents are in ALMA Science Portal (almascience.org).

✓ Good first impression by structured abstract and background.

✓ Big picture and the A-or-B question.

✓ Typical points reviewers point out easily.

✓ Visualization of your expected outcome.

✓ Successful proposals have a graveyard of failures behind them.