Examples of ALMA proposals: science and submission process

Pavel Jáchym

Czech ARC,

Astronomical Institute, AS CR

Available on-line documentation

- Observing with ALMA:
  A Primer for Early Science
  - incl. examples of Early Science observations
- Cycle 0 **Proposer's Guide**
  almascience.eso.org/call-for-proposals/proposers-guide
- Technical Handbook
  almascience.eso.org/call-for-proposals/technical-guide
- there will be Proposer's guide for Cycle 1 with updated information
- **Science** with ALMA
  almascience.eso.org/alma-science

Before you propose

- Target and Science motivation is crucial
- Frequency, bandwidth, velocity resolution
- Desired spatial resolution and largest angular scale (use of ACA?)
- Sensitivity needed etc.
- Is uv-coverage important for you?
- Is there any existing mm/sub-mm observation?
- Find out more about Cycle 1 capabilities
  - details will be released in April 2012
    - more antennas than in Cycle 0
    - more (and more extended) configurations
    - larger mosaics
    - etc.
  - proposal deadline is expected to be in July 2012
  - start of Cycle 1 observations likely at the beginning of 2013 (see https://almascience.nrao.edu/news/alma-early-science-cycle-0-status-report)

Cycle 0 capabilities

Receiver Band	Frequency (GHz)	Angular Resolution (")	Maximum Scale (")	Field of View (")	5σ RMS in 1 hour (mK) continuum	5σ RMS in 1 hour (mJy/beam) continuum	3σ RMS in 4 hours (K) per 1 km/s channel
Properties of Compact Configuration (baselines ~18 m to ~125 m)							
3	*100*	*5.3*	*21*	*62*	*0.65*	*0.14*	*0.030*
6	*230*	*2.3*	*9*	*27*	*1.0*	*0.20*	*0.029*
7	*345*	*1.55*	*6*	*18*	*1.8*	*0.37*	*0.043*
9	*675*	*0.8*	*3*	*9*	*15*	*3.2*	*0.27*
Properties of Extended Configuration (baselines ~36 m to ~400 m)							
3	*100*	*1.56*	*10.5*	*62*	*7.6*	*0.14*	*0.35*
6	*230*	*0.68*	*4.5*	*27*	*11*	*0.20*	*0.34*
7	*345*	*0.45*	*3.0*	*18*	*20*	*0.37*	*0.50*
9	*675*	*0.23*	*1.5*	*9*	*175*	*3.2*	*3.1*

Cycle 0 correlator modes

Mode	Polariza-tion	Band-width per baseband (MHz)	Nchan	Spacing (MHz)	Mode	Polariza-tion	Band-width per baseband (MHz)	Nchan	Spacing (MHz)
1	Single	1875	7680	0.244	7	Dual	1875	3840	0.488
2	Single	938	7680	0.122	8	Dual	938	3840	0.244
3	Single	469	7680	0.061	9	Dual	469	3840	0.122
4	Single	234	7680	0.0305	10	Dual	234	3840	0.061
5	Single	117	7680	0.0153	11	Dual	117	3840	0.0305
6	Single	58.6	7680	0.00763	12	Dual	58.6	3840	0.0153
71	Single	2000	256	7.8125	69	Dual	2000	128	15.625

Note that the velocity resolution will be 2 x spacing due to a default Hanning filter applied to the data. Up to 4 basebands will be available. Mixed band modes will not be possible during *Early Science*.

Technical case

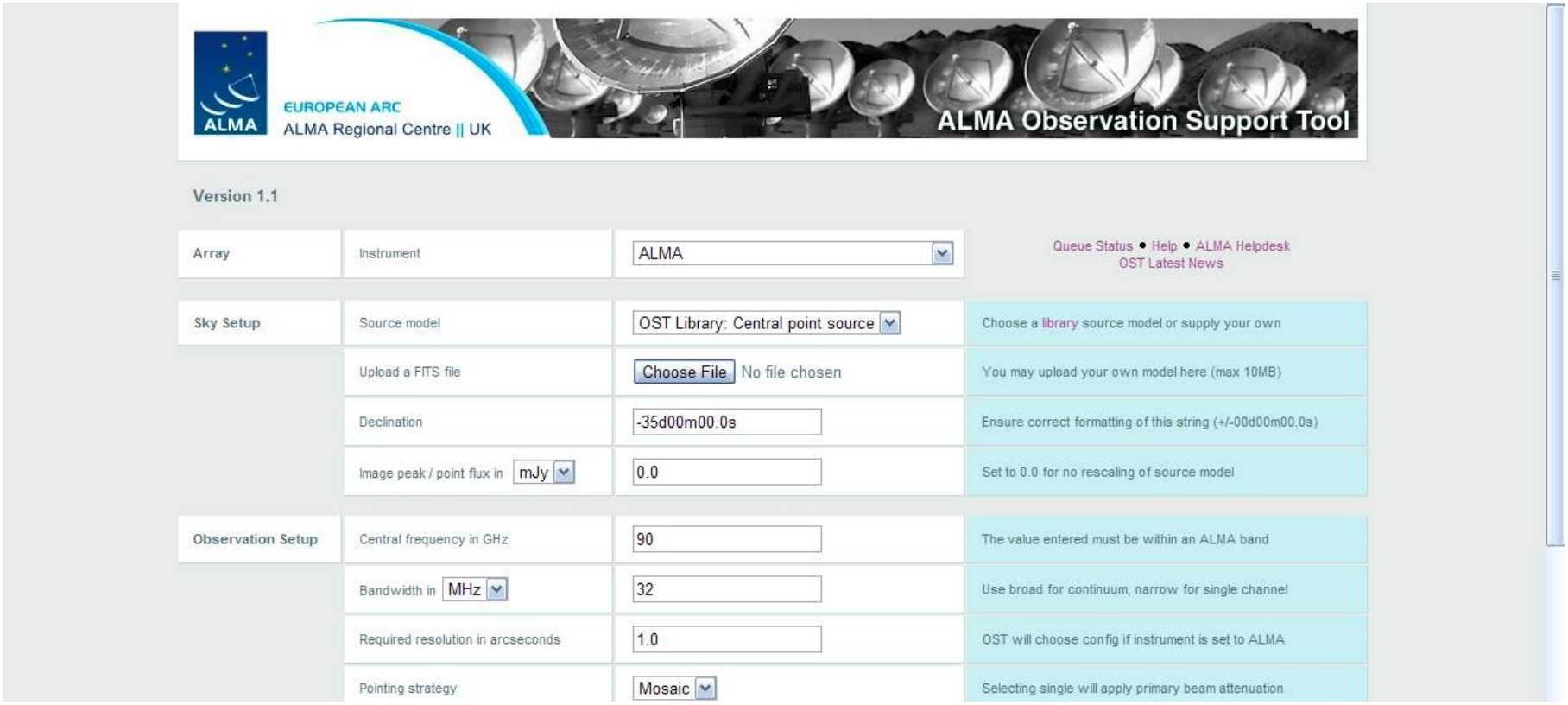
- Receiver Band(s) – spectral line or continuum?
- Angular resolution – configuration (compact/extended)
  - "*the desired angular resolution of 2.3" is by a factor of 10 better than that of previous observations*"
- number of pointings (mosaic?)
- correlator mode – spectral resolution
  - e.g., "*correlator mode 7 provides 1.875GHz x 2basebands = 3.75GHz of spectral bandwidth in each sideband with 488kHz channels (976kHz resolution)*"
- spectral resolution
  - "*the very high spectral resolution of this correlator mode is not necessary for our science goal so we will smooth to 10km/s channels…*"
- number of spectral windows
  - e.g., "*four spectral windows will be set, one centered on the CO line in the USB and three covering basically the remainder of the full width of the sidebands. The line-free parts of the bandwidth will be used for mapping continuum*"
- desired rms (+ observing time estimate)
  - "*this translates to a sensitivity goal of 5.8mJy per channel…*"

ALMA sensitivity calculator

- almascience.eso.org/call-for-proposals/sensitivity-calculator
- Sensitivity: $$\Delta S \propto \frac{T_{sys}}{D^2[n_p N(N-1)\Delta\nu\Delta t]^{1/2}} \mathrm{Wm^{-2}Hz^{-1}}$$
  - e.g., *"Using the ALMA sensitivity calculator, for 16 antennas in compact configuration with 2.3" angular resolution and 13 mK rms per 10 km/s frequency channels, the required observing time per pointing is about 14 min. For the whole mosaic of 17 points the on-source time is about 4 hrs. This yields the total required time of 5 hrs, including all overheads."*

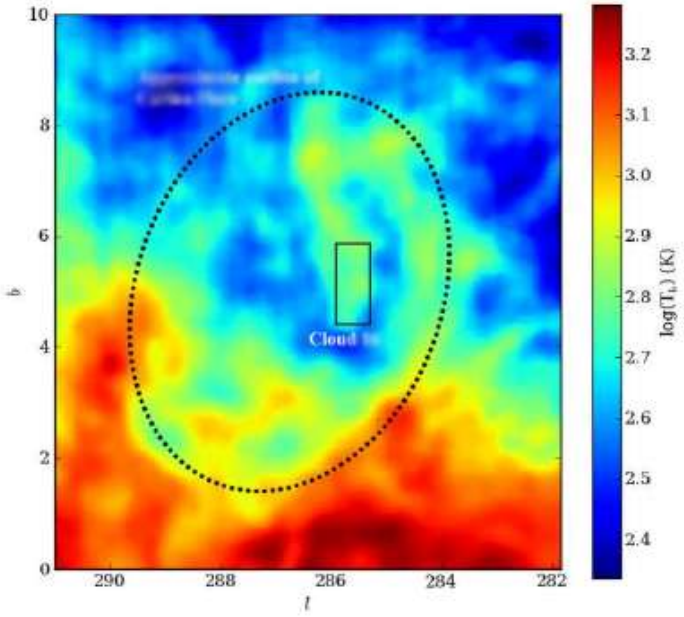
ALMA simulators

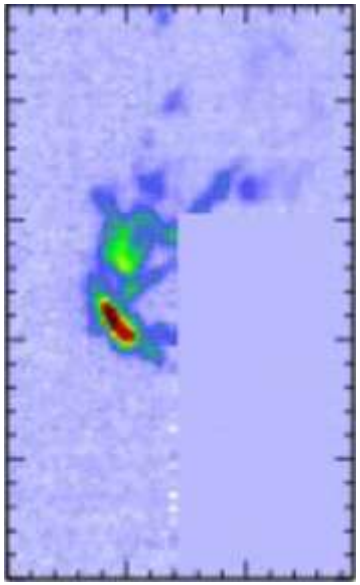
- new tasks in CASA 3.3: sim_observe & sim_analyze
- http://almaost.jb.man.ac.uk

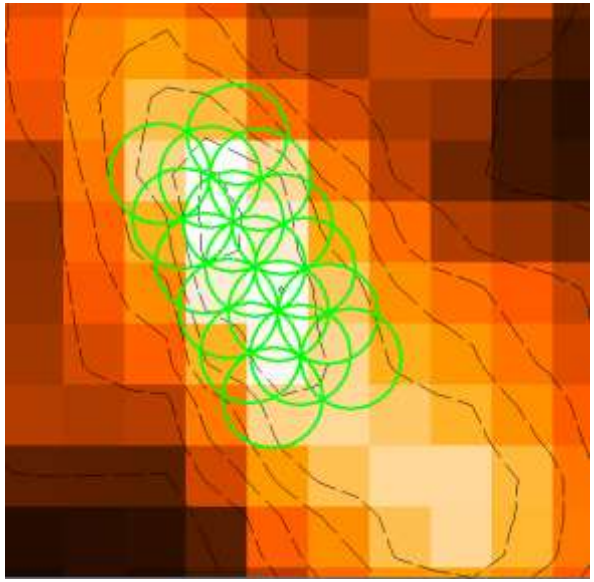


Proposal example 1: Galactic star formation

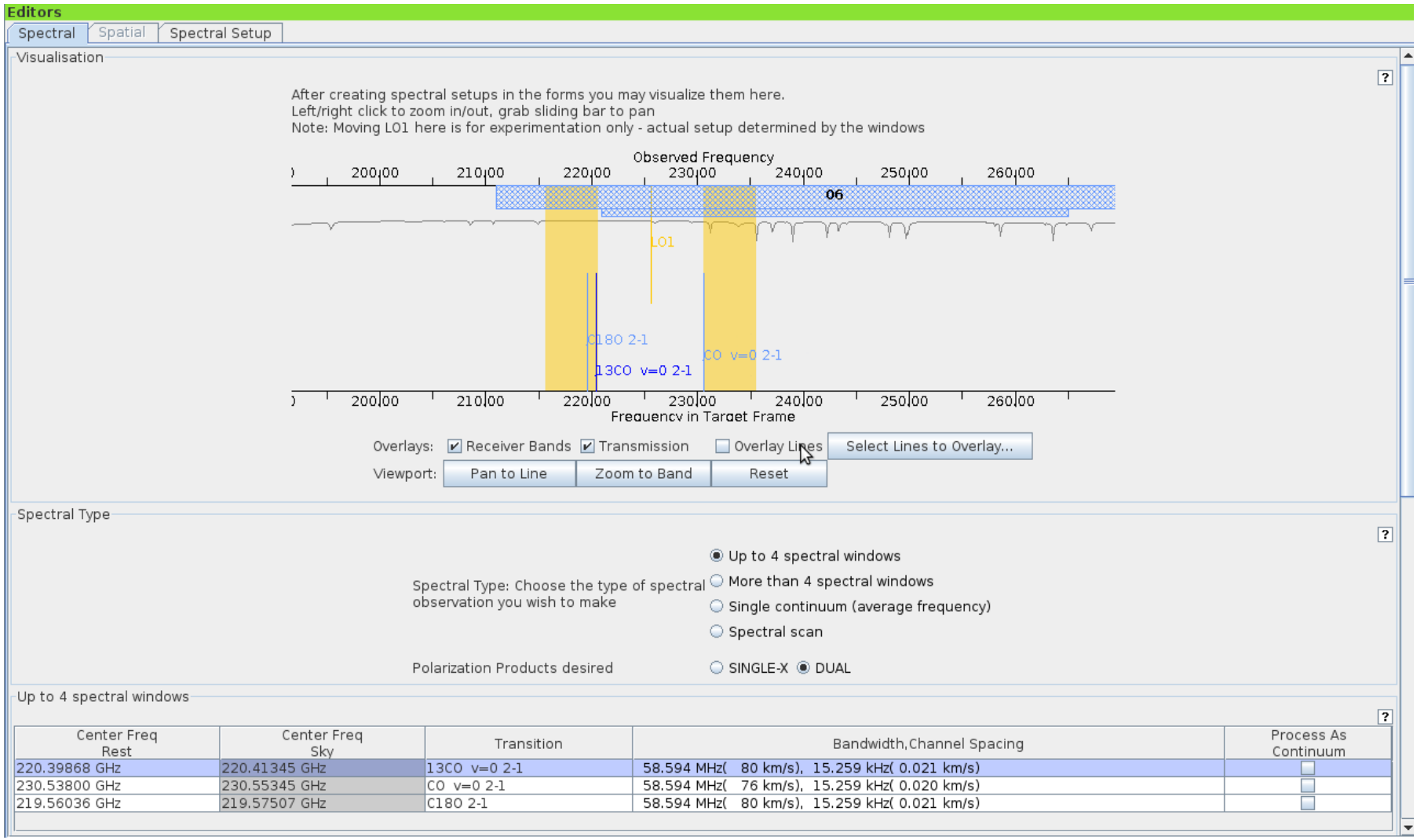
- Fragmentation in a galactic supershell
- 2.3'' angular resolution (compact configuration)
- 60''x40'' mosaic of 17 fields with Nyquist sampling
- 13CO, C18O & 12CO emission (Band 6)
- 0.2km/s resolution (corr. mode 12)
- we have data from APEX





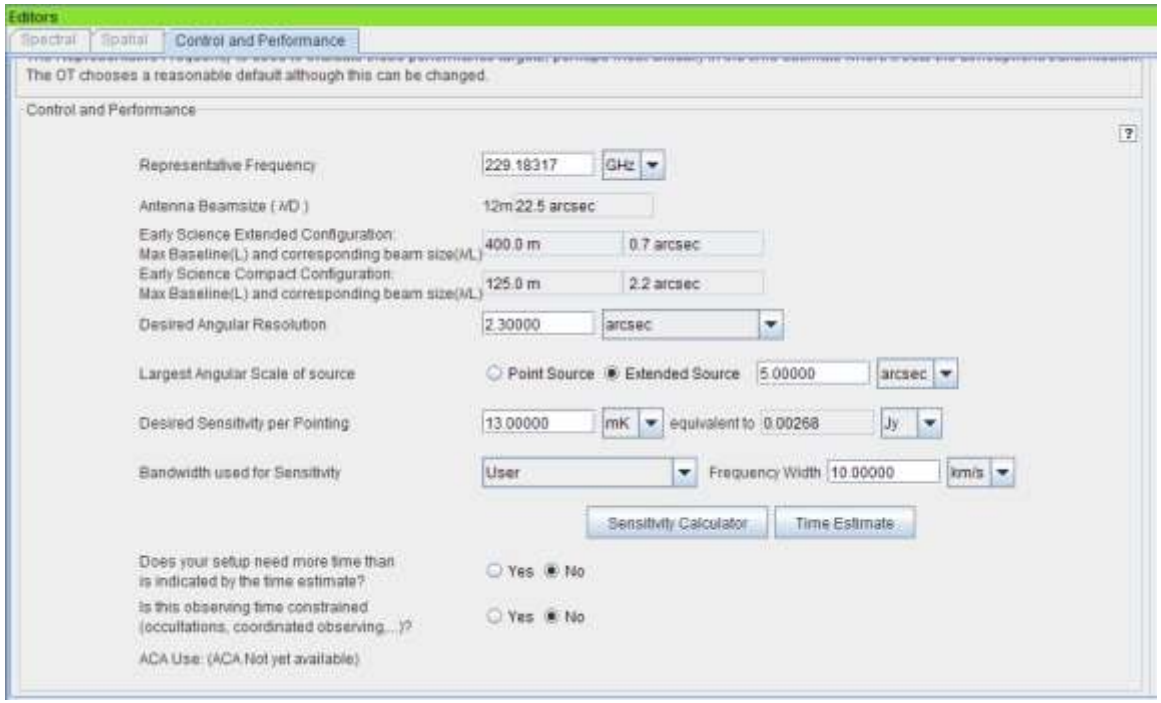


Spectral setup



Proposal example 2: AGN feedback on the ISM

- Jet-ISM collision in the center of a giant elliptical radio galaxy
- 90’’x40’’ mosaic
- search for 12CO(2-1) emission (Band 6), 4 spectral windows
- 2.3’’ resolution (compact conf.)
- 10km/s resolution (corr. mode 7)
- existing APEX data, comparison with Spitzer/HST data

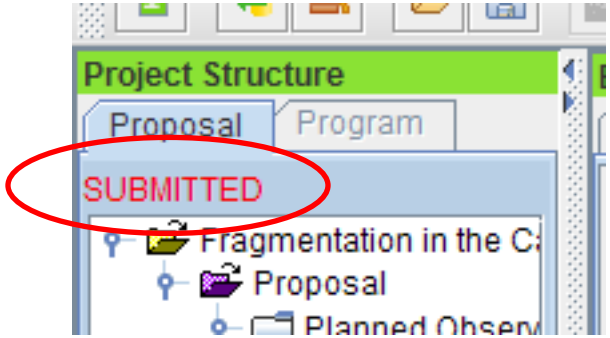


Once submitted

Congratulations!

Your project has been successfully submitted.

PI Name	Your name
Project Name	Your project name
Project Code	2011.0.00XXX.S
Date Submitted	2011-06-29 23:14:37 GMT
Internal Project ID	uid://A001/X3b/Xab1



Your ALMA Cycle 0 Proposal 2011.0.00XXX.S

- Dear Dr. XY,

  The ALMA Early Science Cycle 0 Proposal Review Process has now been completed. The demand for ALMA in its first ever period of scientific observing is extraordinarily high. The quality of the proposals is excellent, as is the breadth of science represented.

  The assessments have been carried out by fifty independent scientists from all over the world through a unified process coordinated by the Joint ALMAObservatory. The number of proposals submitted exceeds the number likely to be executed by a factor of about nine. It follows that many very good projects will not be observed. PIs are being informed that their proposals are either: of the highest priority to be observed; a filler project which will be observed only if the conditions do not allow any higher priority project to be executed; very unlikely to be observed; or technically infeasible.

  Following its scientific assessment by the ALMA Proposal Review Committee (see below), your ALMA proposal

  2011.0.00XXX.S was ranked in the 40-70%/10-20% band of all submitted proposals, and in the 40-70%/10-20% band of the proposals submitted by PIs from Europe.

  Ranking information is provided in the following bands: Top 10%, 10-20%, 20-40%, 40-70%, bottom 30%;

  relative to the global pool, which indicates the assessed scientific value in the context of all the proposals. When relevant, the same information is provided for your regional pool, which determines the likelihood that yourproject will be observed since ALMA time will be apportioned as follows: 33.75% for Europe, 33.75% for North America, 22.5% for East Asia and 10%for Chile. Proposals from other regions are considered solely according to their scientific assessment.

  As a result of its ranking, your project is very unlikely to be observed.

Your ALMA Cycle 0 Proposal 2011.0.00XXX.S - comments

- The following comments on your proposal from the assessors are intended to provide you with constructive feedback. We hope that the comments arehelpful.
  - this proposal identifies an interesting region to study …
  - the proposal is well written, and motivates the choice of target and the importance for studying…
  - there is a large amount of ancillary data, and the proposal describes very well the previous work …
  - however at the object distance, the resolution at 3mm will not be adequate to resolve the smallest clumps
  - the proposal would have been much stronger if it had contained a simulation demonstrating how the short integrations will sample the relevant spatial scales
  - the proposal would have been strengthened by a discussion of the specific scientific aims and choice of transition - why CO(2-1) was chosen over other CO lines
  - there was also some concern that 5 arcsec was an underestimate of the source size
  - technically, the use of a sub-Nyquist sampling in the proposed mosaic is not sufficiently justified
  - …

What to submit

- A good abstract!
- Science Case
  - introduction, aims, objectives
  - incl. figures, tables & references
  - potential for ALMA promotion
- Technical justification
  - desired configuration
  - required resolutions
  - information about the required UV-coverage
  - simulation output
  - desired sensitivity (time estimate)
  - future plans
- Science case + Technical case: 5 pages PDF in total
- You need to make the submission from PI's account in the AOT.

What to expect?

- Cycle 1 deadline likely in July 2012
- Tough competition again expected
  - in Cycle 0:
    - oversubscription by a factor of 9-10
    - about 500 hours available for roughly 100 projects
    - no guarantee, on the best effort basis…
    - projects with PIs from NA, EA, Chile – slightly better chance?
- Use ALMA Helpdesk (help.almascience.org) for any questions!
- Good luck…