

Observing Tool for ALMA Cycle 7

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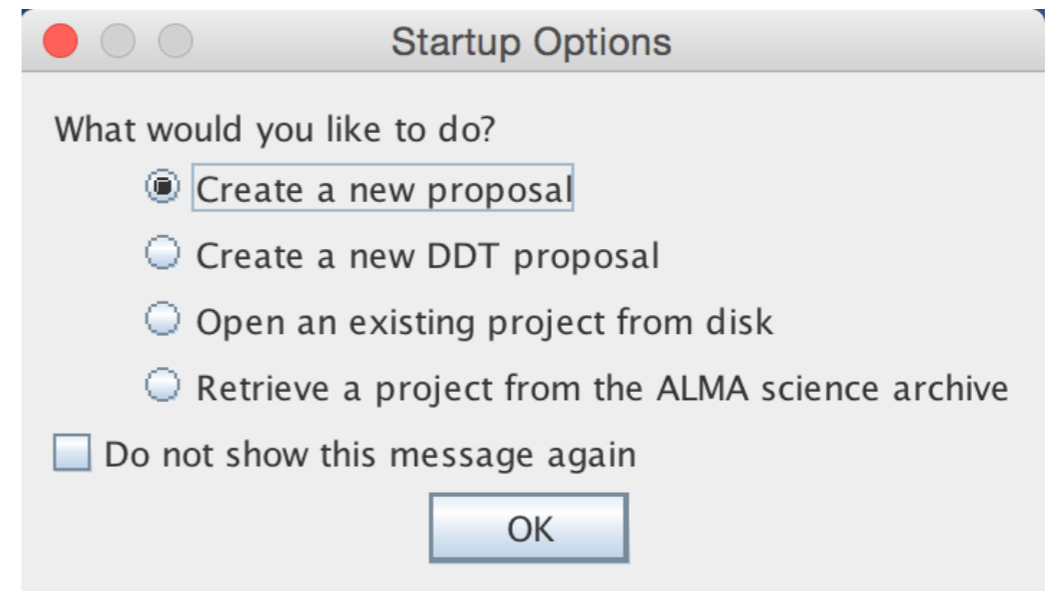
Observing Tool (OT) for ALMA Cycle 7

- java-based tool retrievable from [almascience](http://almascience.org) website (local installation of **Java 8** is required)
 - ✓ webstart version (always updated)
 - ✓ tarball version (offline working, might be outdated)
- the *only* way to submit your ALMA proposal
- the OT offers a visualisation of spatial settings (e.g., pointings in a mosaic), spectral settings (correlator tuning), time estimator, sensitivity calculator, and messages when settings incompatible

Starting up the OT

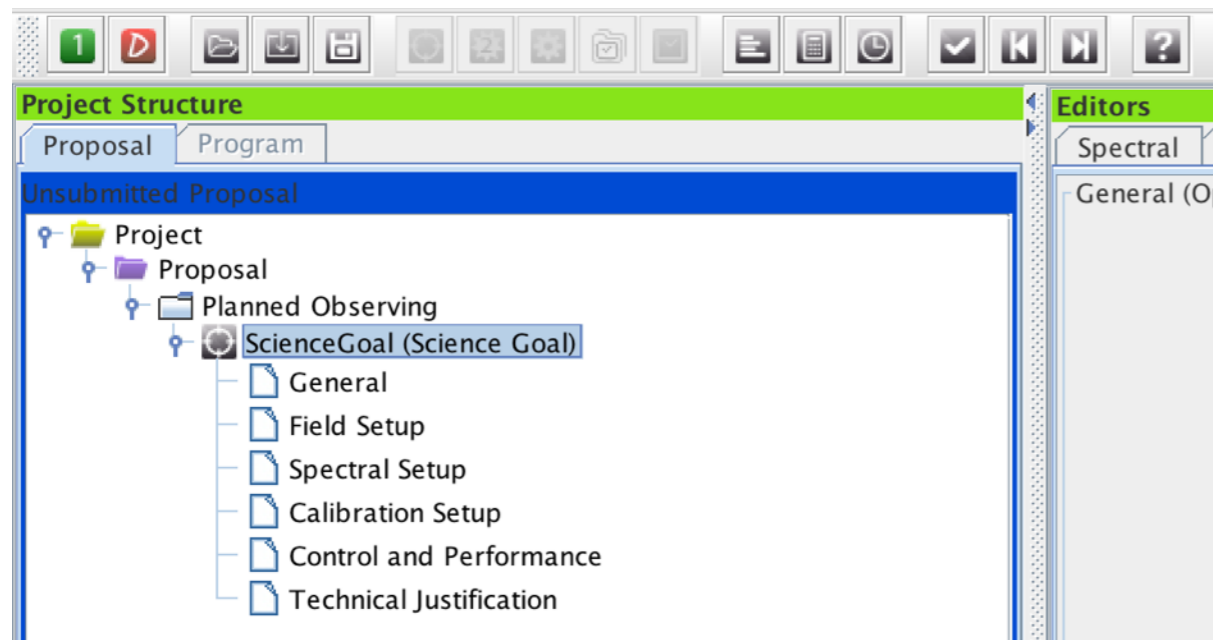


Click logo to start.



- PI/Col have to be registered on almascience website
- select proposal type (regular, VLBI, ToO, large program)
- select scientific category

Science Goals



Specify source/sources:

- For sources widely distributed in the sky the SG will be split by the OT into different “clusters” (scheduling blocks).
- Each cluster groups all sources within 10 degrees.
- No restriction on the total number of sources in a SG, but for each grouping within the SG, the total number of pointings must be less than or equal to 150.

Field setup

- Resolve by Source Name (NED, Simbad)
- SSO incl. Sun (tick box, select object, *Sun*, *Ephemeris: upload ephemeris file*)
- upload Sources from file (see help for file format)
- **important: provide expected source properties!**

The screenshot shows a 'Source' configuration window with the following fields and options:

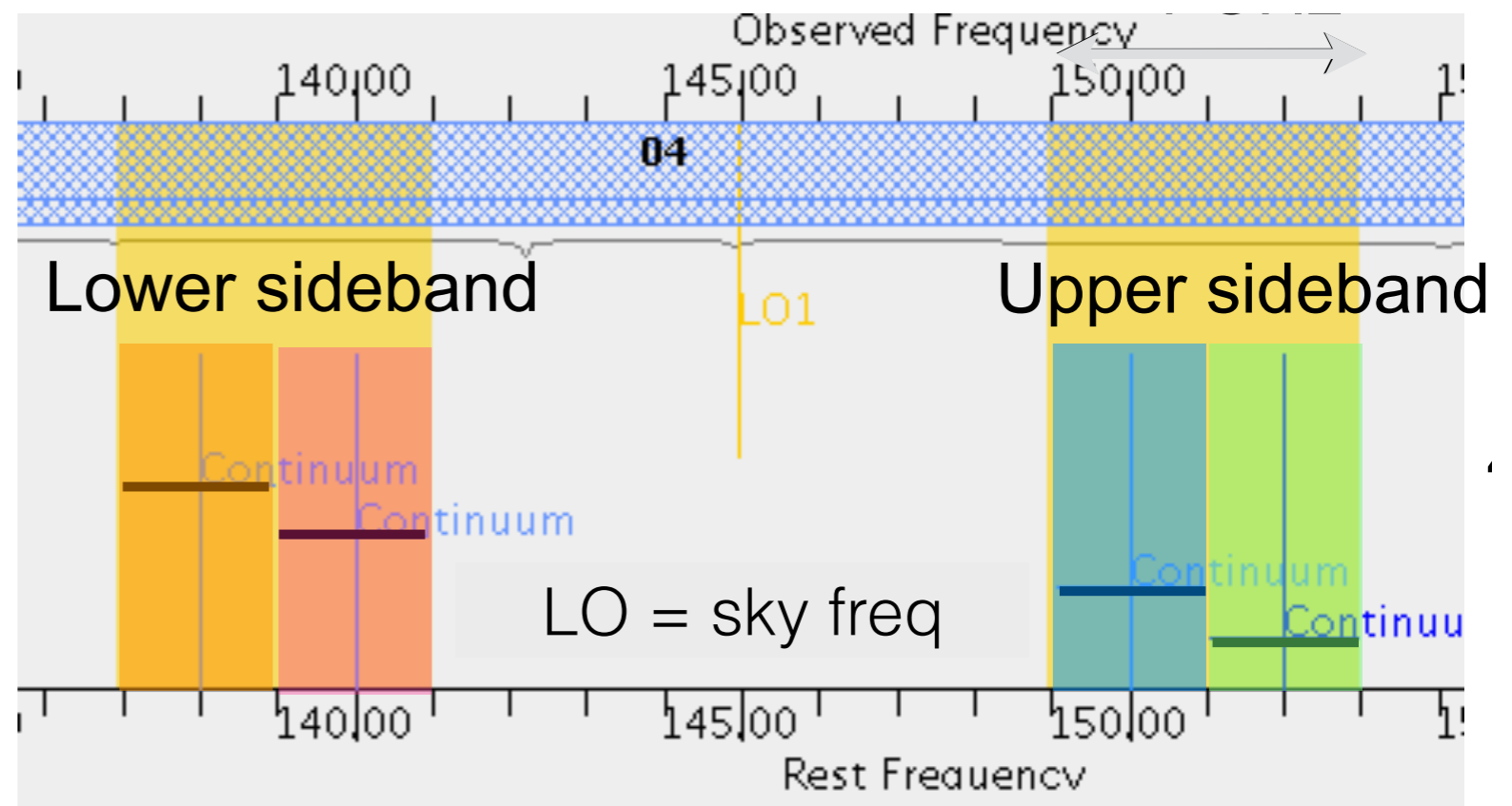
- Source Name:** An empty text input field with a 'Resolve' button to its right.
- Choose a Solar System Object?:** An unchecked checkbox.
- Name of object:** A dropdown menu currently set to 'Unspecified'.
- System:** A dropdown menu set to 'FK5 J2000'.
- Sexagesimal display?:** A checked checkbox.
- Source Coordinates:**
 - RA:** Text input field containing '00:00:00.0000'.
 - Dec:** Text input field containing '00:00:00.000'.
 - Parallax:** Text input field containing '0.00000' with a unit dropdown set to 'mas'.
 - PM RA:** Text input field containing '0.00000' with a unit dropdown set to 'mas/yr'.
 - PM DEC:** Text input field containing '0.00000' with a unit dropdown set to 'mas/yr'.
- Source Radial Velocity:** Text input field containing '0.000' with a unit dropdown set to 'km/s', a 'lsrk' dropdown, and a 'z' text input field containing '0.000000000'.
- Doppler Type:** A dropdown menu set to 'RADIO'.
- Target Type:** Two radio buttons: 'Individual Pointing(s)' (which is selected) and '1 Rectangular Field'.

Spectral setup

Spectral line (single, dual, full pol)

Continuum (single, dual, full pol)

Spectral scan (single, dual pol)

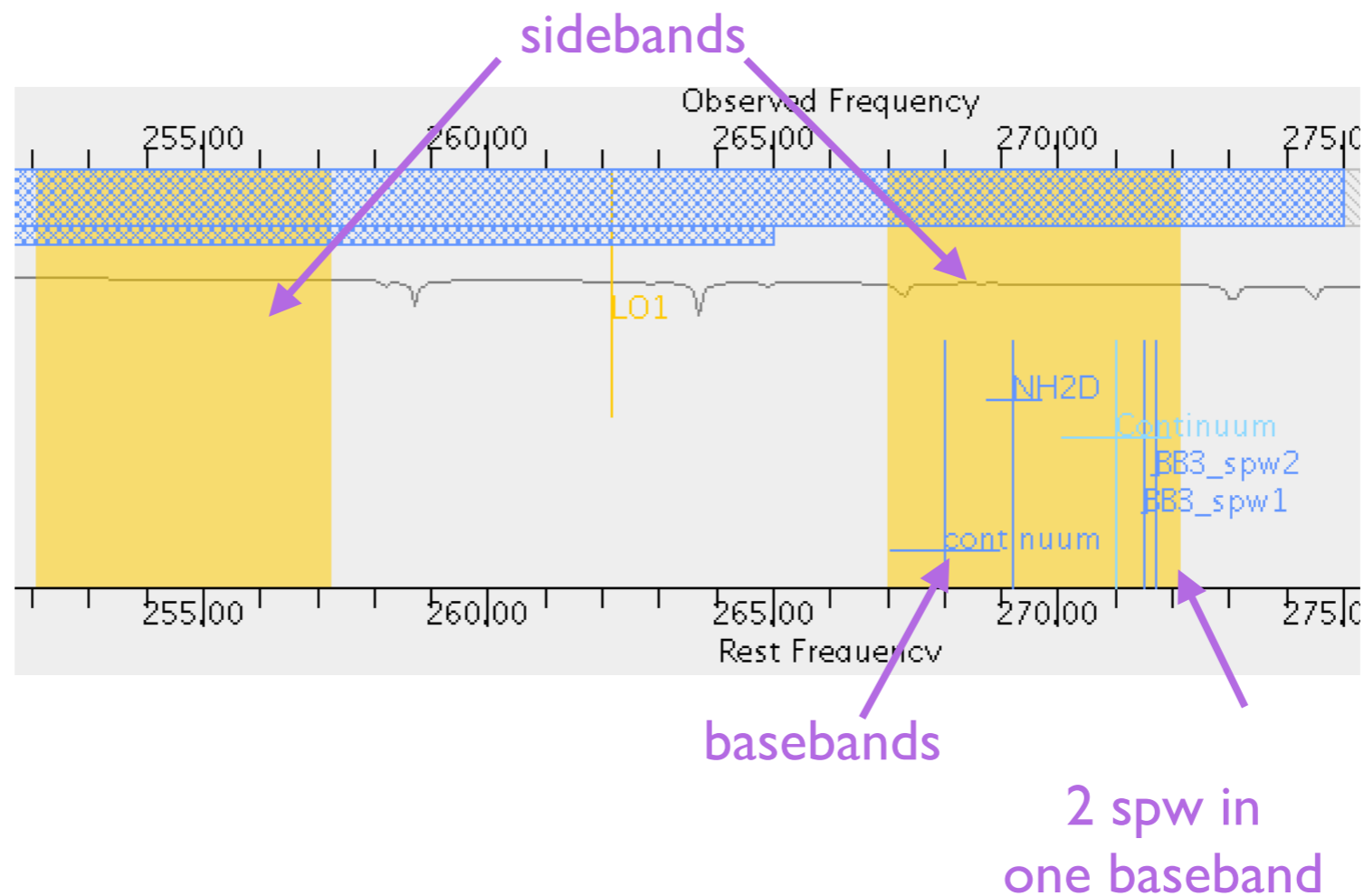


- 4 basebands (BBs), each max 2GHz, to be placed in two sidebands (SBs)
- SB widths different per band (band 3,4, 5, 7,8: 4GHz; band 9,10: 8 GHz)
- band 6 IF has been extended from 5 to 5.5 GHz to observe CO and ^{13}CO simultaneously.
- 90-degree Walsh switching Band 9 and 10: 16 GHz instantaneous bandwidth available with some spectral setup

Spectral line setups

- each BB can contain up to 4 spectral windows (spw)
- all spws in one BB should have the same *resolution*
- better higher spectral resolution, but *keep data rate < 70MB/s*

Note: the default correlator setup for FDMs averages every two channels



Spectral line setups

- Use the ALMA spectral line database

Note: Continuum BB and spectral lines can be mixed (Spectral line mode)

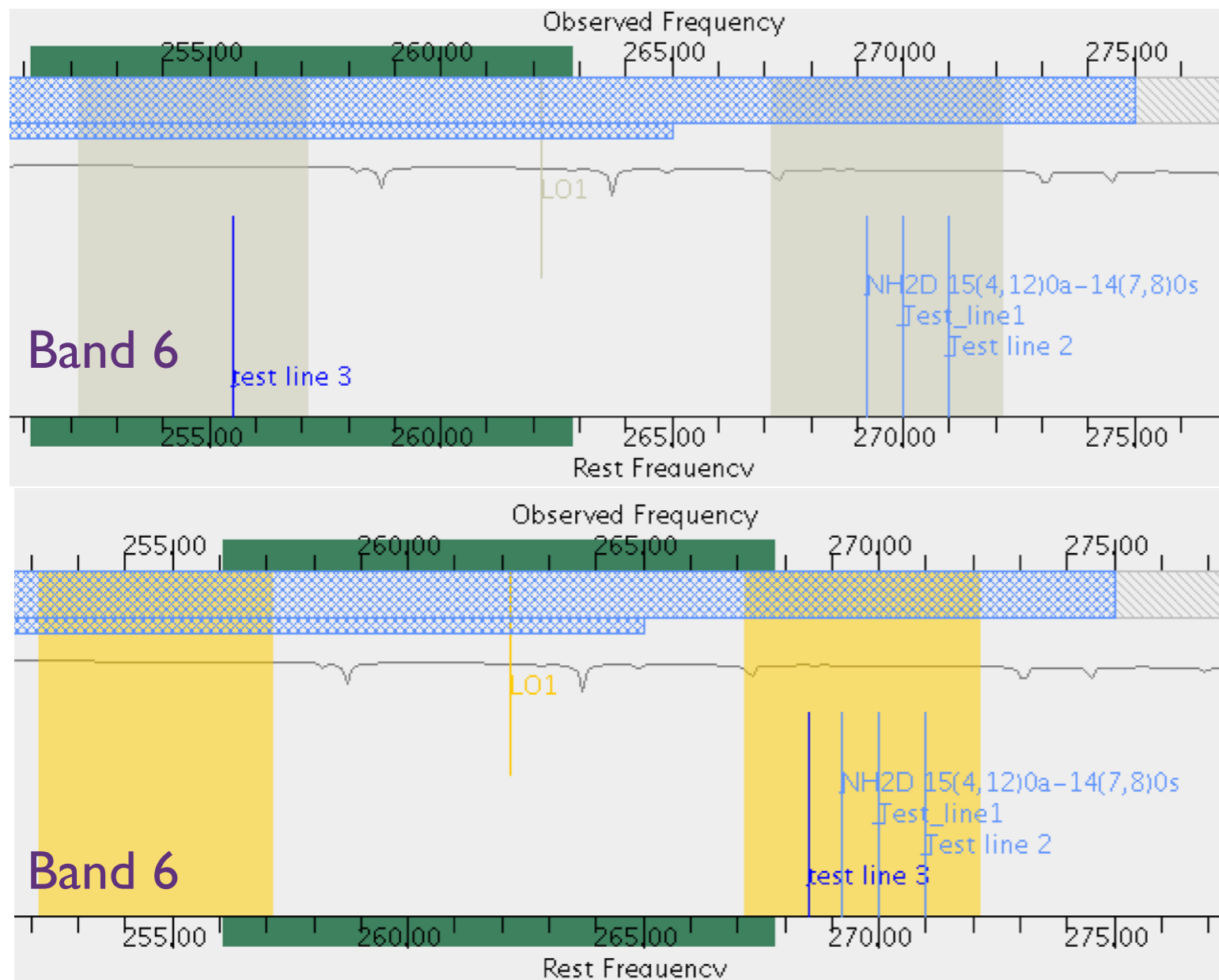
- Set unused spws to continuum to help with calibration and continuum removal, in particular if you have narrowband spw

• Carefully select the representative spw: will be used for all frequency/spectral resolution dependent calculations, such as FOV, MRS, angular resolution, atmospheric opacity

- Define rest frequencies of lines: information is used for QA2

Baseband limitations

- 2SB receivers (bands 3,4,5,6,7,8) cannot have 3 BBs in one sideband and 1 BB in the other
- DSB receivers (bands 9,10) have no BB/sideband restrictions



Bad spectral configuration

BBs stay grey in *spectral viewer*

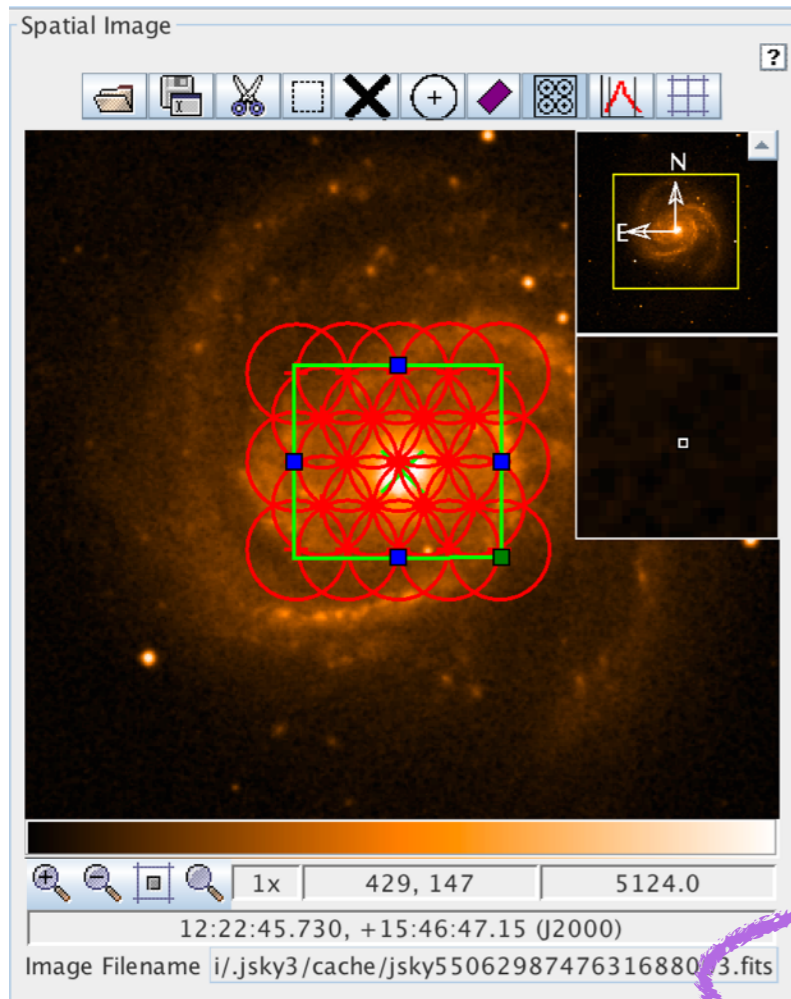
Bad spectral configuration gives error messages in red

Spectral configuration OK

BBs become yellow

Spatial setup (once the spectral setup is done)

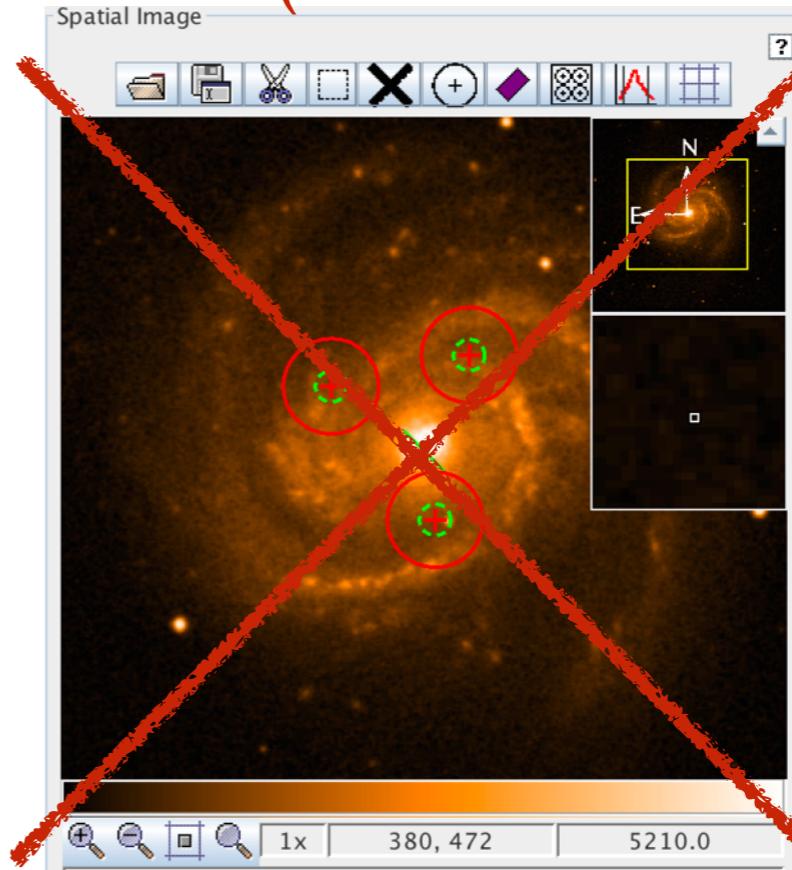
Rectangular field (mosaic)



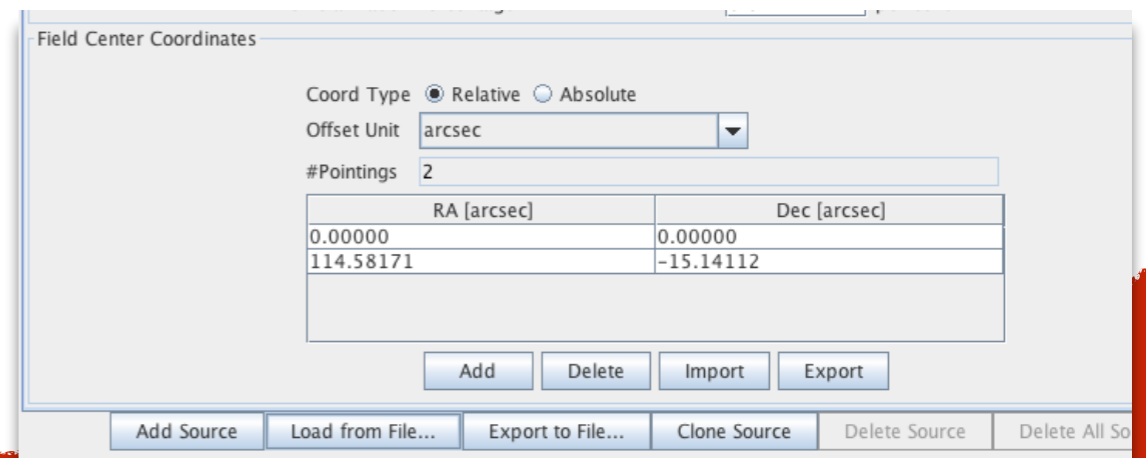
Repr. freq from spectral setup

Primary beam or FOV $\sim \lambda/D$

Individual pointing
(cannot contain multiple offsets)



clone sources for multiple offsets



Control and performance

OT calculates the angular resolution/maximum recoverable scale (MRS) for the most extended and most compact 12m Array, and the ACA 7m array based on the frequency and the source declination

Enter the desired performance,
angular resolution, MRS,
sensitivity and the bandwidth
for sensitivity

Based on the user selected resolution and MRS the OT will choose the most suitable array(s) (incl. ACA stand alone)

Control and performance

- Angular resolution interface is more flexible
 - single / range / any / Standalone ACA
 - possible configurations are given

Desired Performance

Desired Angular Resolution (Synthesized Beam) Single Range Any Standalone ACA

0.5 arcsec to 1.5 arcsec

Largest Angular Structure in source 15.0 arcsec

Desired sensitivity per pointing 1.00000 mJy equivalent to 12.322 mK @ 1.50 " and 0.11090 K @ 0.500 "

Bandwidth used for Sensitivity AggregateBandWidth Frequency Width 7.500000 GHz

Science goal integration time estimate Time Estimate

Override OT's sensitivity-based time estimate (must be justified) Yes No

Control and performance

OT Time estimation uses the sensitivity calculator to derive the total time for the SG incl. calibration. It will divide sources with large separations in clusters that have their own calibrators, and show the number of tunings per cluster.

Note: The time in brackets is that required to reach the sensitivity. Operational requirements often mean that the actual observed time is longer, especially for mosaics. Please see the User Manual for more details.

Input Parameters

Requested sensitivity	1.000 mJy
Bandwidth used for sensitivity	7.500 GHz
Representative frequency (sky, first source)	210.00 GHz

Estimated Total time for Science Goal 2.35 h

Cluster 1

Source Name	RA	Dec	Velocity
M100	12:22:54.8989	15:49:20.569	1569.779 km/s

Possible Configuration Combinations

12-m (1)	12-m (2)	7-m	TP
C43-2	None	Yes	No
C43-3	None	Yes	No

Input Parameters

Precipitable water vapour (all sources)	1.796mm (5th Octile)
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Time required for 12m (1) [C43-3]

Time on source per pointing (first source)	2.52 min [972.60 ms]
Total number of pointings (all sources)	2
Number of tunings	1
Total time on source	5.04 min [1.95 s]
Total calibration time	13.17 min
Other overheads	5.25 min
Total time for 1 EB execution	23.46 min

Close

Other for Cycle 7

Band 5 spws: can be placed in the overlap region between Bands 4 and 5 (158-163 GHz)

Band 7: all configurations, out to C43-10, should now be available

Project Tree: certain parts of the Project Tree can now be cloned

Technical Justification

Justify your chosen sensitivity and bandwidth for sensitivity 

Sensitivity ?

Requested RMS over 7.500 GHz is 20.00 mJy For a peak flux density of 100.00 mJy , the S/N is 5.0

Achieved RMS over the total 7.500 GHz bandwidth is 37.78 uJy For a continuum flux density of 100.00 mJy , the achieved S/N is 2647.1

Justify your requested RMS and resulting S/N for the spectral line and/or continuum observations.
For line observations also justify the bandwidth used for the sensitivity calculation.

The OT provides you with a sensitivity summary

Justify your angular resolution and MRS 

Numbers to be double checked trigger a message in blue

Justify your spectral resolution and data rate 

Only spectral dynamic range < 1000 (B3,4,6), 500 (B5), 400 (B7), 250 (B8), 170 (B9), 150 (B10) allowed

Figures/Tables required for Technical Justification have to be present in Scientific Justification

Limitations for Solar and VLBI proposals

Solar observations: continuum mode (single or dual pol) in a predefined spectral range of band 3, 6, and **7 (NEW!)**.



VLBI observations: continuum mode (full pol) in a predefined spectral range of band 3 and 6, and *require a separate proposal to the GMVA or EHT*

PI does not ask for a sensitivity, but directly for observing time in limited time slots

In case of problems...

Knowledgebase

Why does the Cycle 4 OT report an achieved RMS of 0.00 Jy?

25 March 2016 02:58 PM



The Cycle 4 Observing Tool (version 201603-CYCLE4-OFF-B) contains a bug in the Technical Justification section of a Science Goal that reports an achieved RMS of 0.00 Jy (S/N of infinity). This error does not affect proposal validation or time estimates. We recommend that users ignore these incorrect values in the Technical Justification and proceed with the normal proposal submission process.

ALMA Observing Tool (Cycle4) - Project

File Edit View Tool Search Help Perspective 1

Project Structure

- Submitted Proposal
- Project
 - Proposal
 - Planned Observing
 - ScienceGoal (Science Goal)
 - General
 - Field Setup
 - Spectral Setup
 - Calibration Setup
 - Control and Performance
 - Technical Justification

Editors

Spectral Spatial Technical Justification

Enter a Technical Justification for this Science Goal, paying special attention to the parameters reproduced below.

Sensitivity

Requested RMS over 7.500 GHz is 500.00 mJy For a peak flux density of 2.00 Jy , the S/N is 4.0

Achieved RMS over the total 7.500 GHz bandwidth is 0.00 Jy For a continuum flux density of 2.00 Jy , the achieved S/N is Infinity

For a peak line flux of 1.00 Jy , the achieved S/N over 1/3 of the source line width (25.00 km/s / 3 = 8.33 km/s) is Infinity

Line width / bandwidth used for sensitivity (25.00 km/s / 9291.09 km/s) = 0.003

Note that the bandwidth used for sensitivity is larger than 1/3 of the linewidth.
The S/N achieved for a resolution element that allows the line to be resolved will be lower than that reported.
Justify your requested RMS and resulting S/N for the spectral line and/or continuum observations.
For line observations also justify the bandwidth used for the sensitivity calculation.

Contextual Help

1. Please ensure you and your co-Is are registered with the [ALMA Science Portal](#)
2. Create a new proposal by either:
 - Selecting *File > New Proposal*
 - Clicking on the icon in the toolbar
 - Or clicking on this [link](#)
3. Click on the proposal tree node and complete the relevant fields.

Phase I: Science Proposal

New Science Proposal → Create Science Goals → Validate Science Proposal → Submit Science Proposal

Click on the overview steps to view the contextual help

Importing And Exporting Template Library Need More Help? View Phase 2 Steps

Check the knowledgebase
or contact us!

Completing the proposal

1. Validate your proposal

This brings up any problem, such missing Scientific Justification, or badly set spectral settings.

Only validated proposal can be submitted!

Validation errors are given in the
Feedback window

2. Display project time summary

Gives an overview of observing time of the whole proposal and the data rate, plus expected data size

3. Make a pdf overview and save the .aot file on your disk

OT documentation and Help

OT contains the ALMA
template library of aot
files for Cycle 7

OT Help includes the User manual and
reference guide

ALMA website contains the OT
quickstart guide, manual and
reference guide, Cycle 7 proposers
guide, and OT video tutorials

Submit questions to the ALMA
Helpdesk or your ARC!