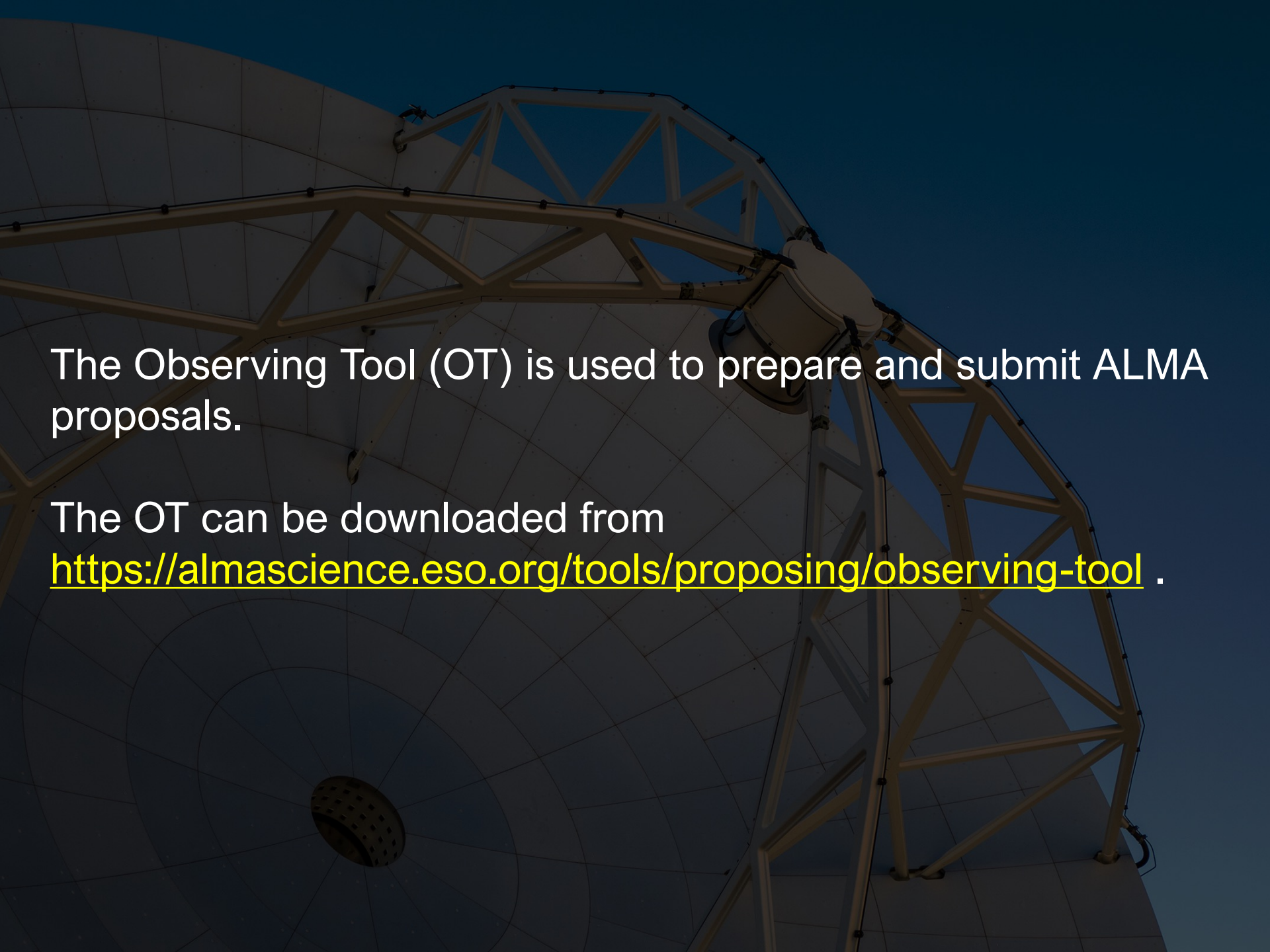


The Observing Tool

George Bendo

UK ALMA Regional Centre Node
Jodrell Bank Centre for Astrophysics
The University of Manchester

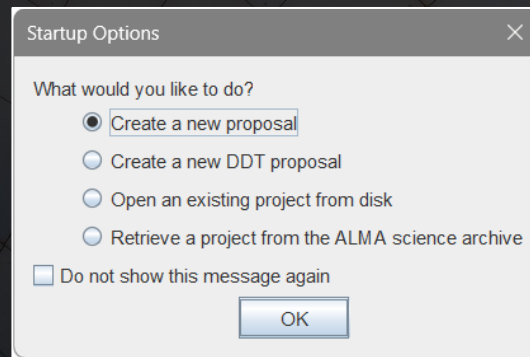




The Observing Tool (OT) is used to prepare and submit ALMA proposals.

The OT can be downloaded from <https://almascience.eso.org/tools/proposing/observing-tool> .

When starting the OT, a pop-up window will ask whether to create a new proposal or open an existing one.

A screenshot of a 'Startup Options' dialog box overlaid on a background image of a radio telescope dish. The dialog box is white with a grey title bar and a close button (X) in the top right corner. It contains the text 'What would you like to do?' followed by four radio button options and one checkbox option. The first option, 'Create a new proposal', is selected. Below the options is an 'OK' button.

Startup Options

What would you like to do?

- Create a new proposal
- Create a new DDT proposal
- Open an existing project from disk
- Retrieve a project from the ALMA science archive

Do not show this message again

OK



After selecting “Create a new proposal”, the OT will display the template for a new program.

(The flow chart on the bottom is not really useful and can be minimized.)

The screenshot displays the ALMA Observing Tool (Cycle 9 Phase 1) interface. The main window is titled "ALMA Observing Tool (Cycle 9 (Phase 1)) - Project" and contains a "Project Structure" pane on the left and an "Editors" pane on the right. The "Editors" pane is currently showing the "Project" tab, which includes a "Principal Investigator" field with a "Select PI..." button and a "Main Project Information" section with fields for "Project", "Assigned Priority", and "Project Code".

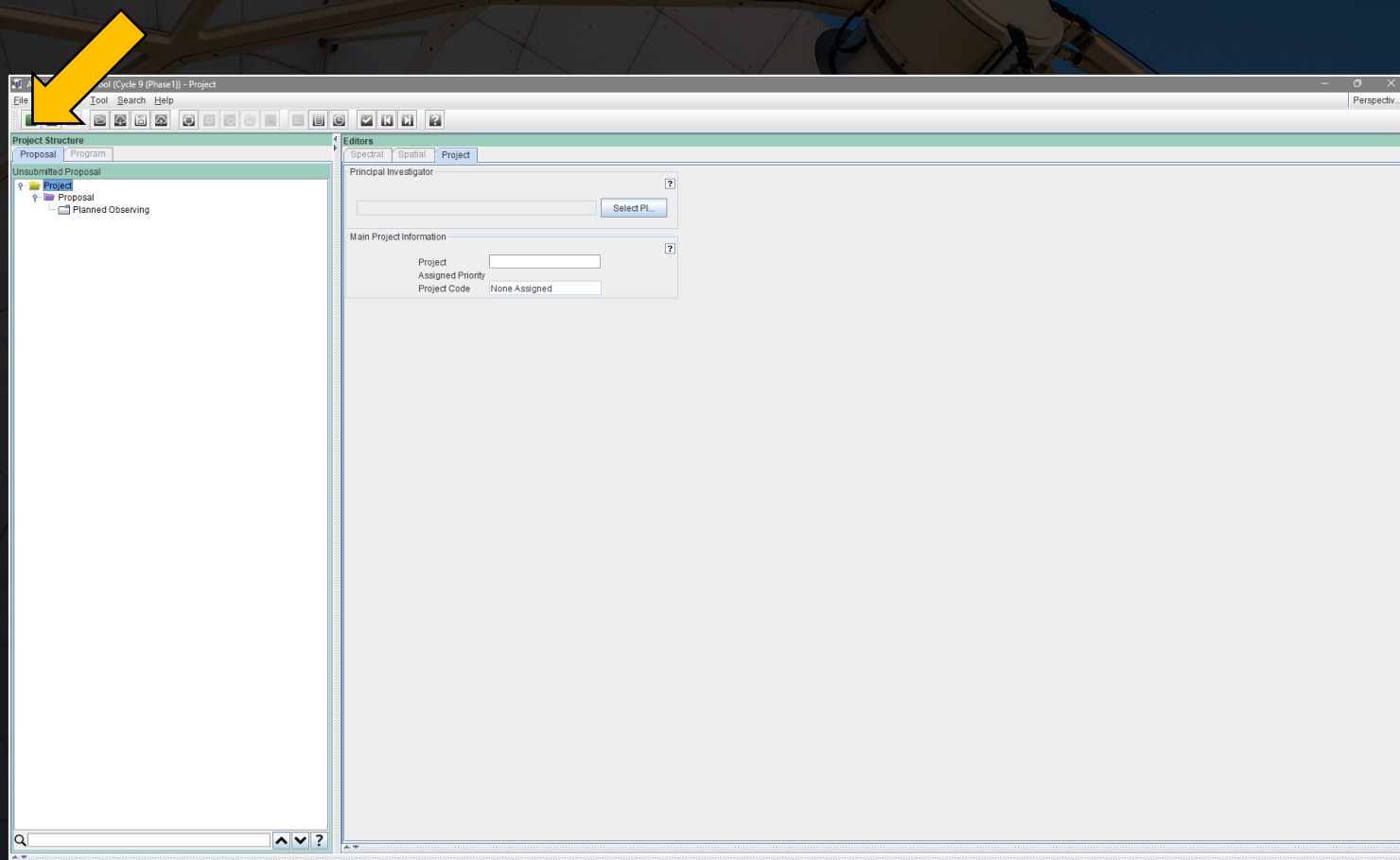
At the bottom of the interface, there is an "Overview" section. On the left, there is a "Contextual Help" box with the following text:

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.

On the right, there is a "Phase 1: Science Proposal" flow chart. The flow chart consists of four main steps: "New Science Proposal", "Create Science Goals", "Validate Science Proposal", and "Submit Science Proposal". Below the flow chart, there are four buttons: "Importing And Exporting", "Template Library", "Need More Help?", and "View Phase 2 Steps".

Proposals can also be created or opened by either selecting the corresponding options from the File menu or button bar.



The proposal tab shows summary information about the proposal, including the abstract and authors of the project.

The science case is also attached using a button in this tab.

ALMA Observing Tool (Cycle 9 (Phase 1)) - Project

File Edit View Tool Search Help

Project Structure

Unsubmitted Proposal

Project

Planned Observing

Editors

Spectral Spatial Proposal

Proposal Information

Proposal Title

Proposal Cycle: 2022.1

Abstract (max. 1200 characters)

Proposal Type

Regular Target Of Opportunity VLBI
 Large Program Phased Array

Scientific Category

Cosmology and the High Redshift Universe Galaxies and Galactic Nuclei ISM, star formation and astrochemistry
 Circumstellar disks, exoplanets and the solar system Stellar Evolution and the Sun

Please select one or two keywords

Student project

Investigators

Type	Full name	Email	Affiliation	ALMA ID	Executive	Reviewer
PI	Not set	Not set	Not set	Not set	Non-ALMA	<input checked="" type="checkbox"/>

Select PI Add CoPI Add Col Remove Collaborator Add from Proposal

Reviewer Information

The science case is a separate LaTeX document that can be downloaded from <https://almascience.eso.org/documents-and-tools/proposing/proposal-template> .

1 Scientific justification

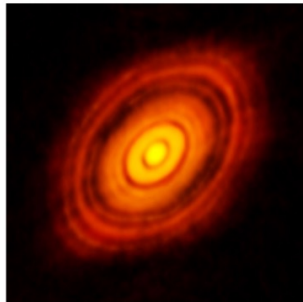


Figure 1: ALMA image of the protoplanetary disc surrounding the young star HL Tauri.

Table 1: Here we show the continuum sensitivity required per band.

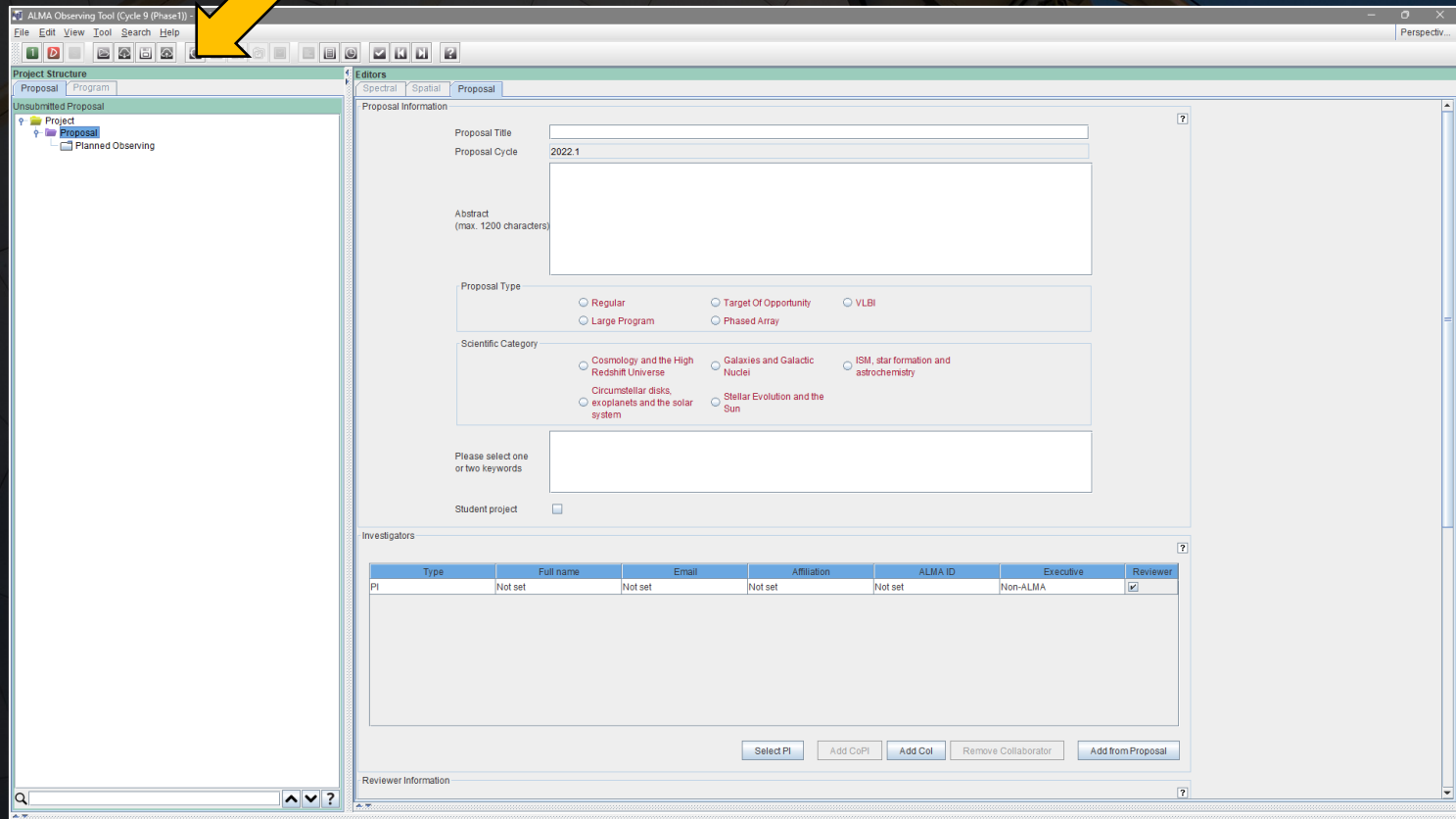
Frequency (GHz)	Sensitivity (mJy)
300	0.10
850	0.50

2 Description of observations

3 References

- [1] Author1 et al. year, journal, vol, page
- [2] Author2 et al. year, journal, vol, page

The observations are set up by adding Science Goals, which can be done by either right-clicking on the Planned Observations tab or clicking the corresponding button in the button bar.



The screenshot shows the ALMA Observing Tool interface. A yellow arrow points to the 'Planned Observing' button in the toolbar. The interface is divided into several sections:

- Project Structure:** Shows a tree view with 'Project' and 'Planned Observing'.
- Editors:** Contains the main form for proposal information.

Proposal Information:

- Proposal Title: [Text Field]
- Proposal Cycle: 2022.1
- Abstract (max. 1200 characters): [Text Area]
- Proposal Type: Regular, Large Program, Target Of Opportunity, Phased Array, VLBI
- Scientific Category: Cosmology and the High Redshift Universe, Circumstellar disks, exoplanets and the solar system, Galaxies and Galactic Nuclei, Stellar Evolution and the Sun, ISM, star formation and astrochemistry
- Please select one or two keywords: [Text Field]
- Student project:

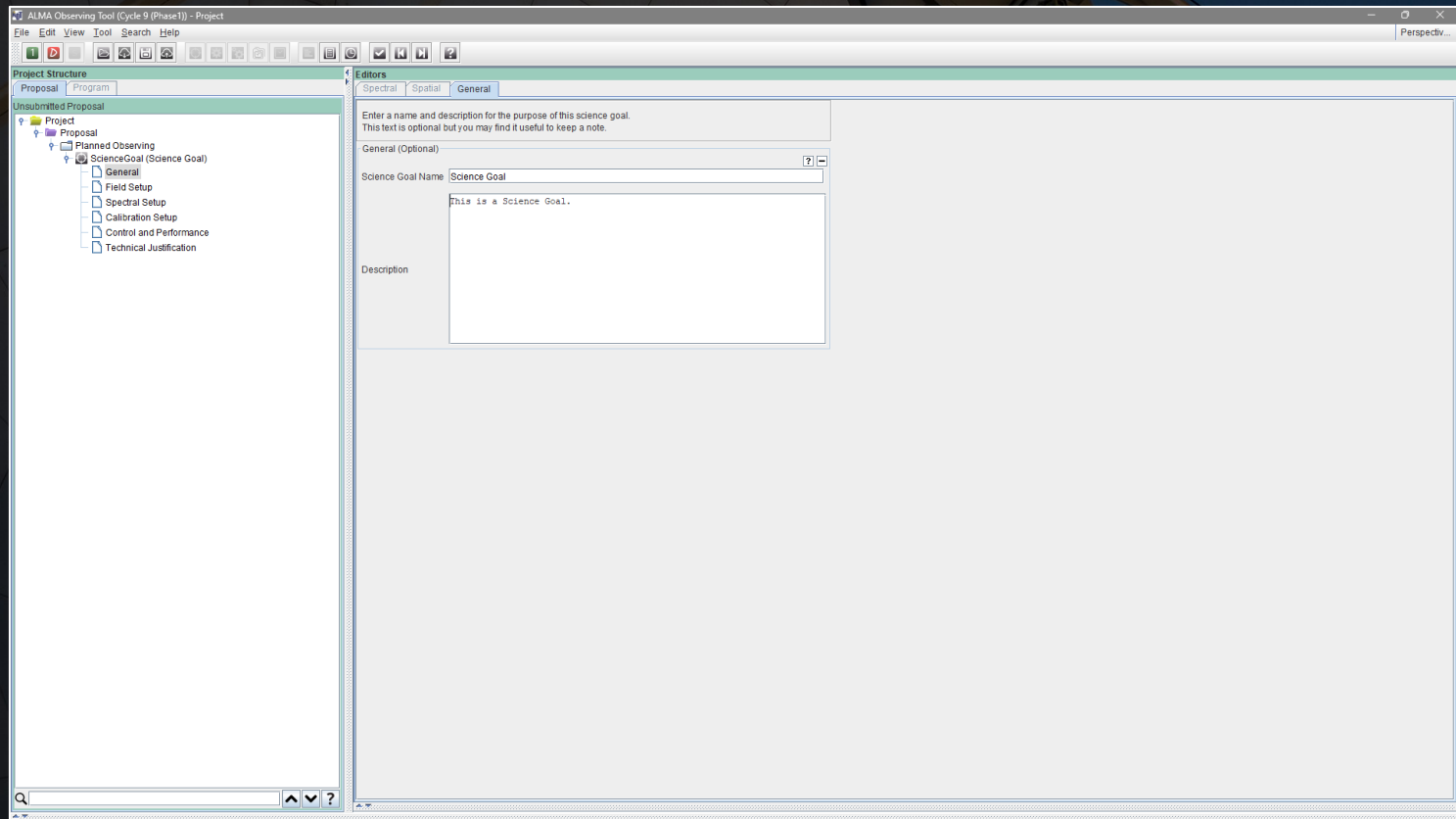
Investigators:

Type	Full name	Email	Affiliation	ALMA ID	Executive	Reviewer
PI	Not set	Not set	Not set	Not set	Non-ALMA	<input checked="" type="checkbox"/>

Buttons at the bottom: Select PI, Add CoPI, Add Col, Remove Collaborator, Add from Proposal.

Each Science Goal consists of a set of six tabs.

The General tab describes the Science Goal.



The Field Setup tab describes the locations in the sky to be observed.

Multiple sources can be specified in this tab. Mosaic observations can also be specified here.

ALMA Observing Tool (Cycle 9 (Phase 1)) - Project

File Edit View Tool Search Help

Project Structure

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

Editors

Spectral Spatial Field Setup

Spatial Image

M83

Source

Source Name: M83

Choose a Solar System Object? Name of object: Unspecified

System: ICRS Sexagesimal display?

Source Coordinates: RA: 13:37:00.9152, Dec: -29:51:56.739

Source Radial Velocity: 519.100 km/s hel z: 0.001733033 Doppler Type: RELATIVISTIC

Target Type: Individual Pointing(s) 1 Rectangular Field

Expected Source Properties

Peak Continuum Flux Density per Synthesized Beam: 0.00000 Jy

Continuum Linear Polarization: 0.0 per cent

Continuum Circular Polarization: 0.0 per cent

Peak Line Flux Density per Synthesized Beam: 0.00000 Jy

Line Width: 0.00000 km/s

Line Linear Polarization: 0.0 per cent

Line Circular Polarization: 0.0 per cent

Field Centre Coordinates

Coord Type: Relative Absolute

Array Type: 12m

Offset Unit: arcsec

#Pointings: 12m Array: 1

RA [arcsec]	Dec [arcsec]
0.00000	0.00000

Add Source Load from File Export to File Clone Source Delete Source Delete All Sources

The Field Setup tab describes the locations in the sky to be observed.

Multiple sources can be specified in this tab. Mosaic observations can also be specified here.

The screenshot shows the ALMA Observing Tool interface. On the left, the Project Structure tree is visible, with 'Field Setup' selected under 'Planned Observing'. The main window is divided into three tabs: 'Spectral', 'Spatial', and 'Field Setup', with 'Field Setup' being the active tab. The 'Spatial Image' panel shows a star field with two sources marked by red circles. The 'M83' source configuration panel is open, showing the following details:

- Source Name:** M83
- System:** ICRS
- Source Coordinates:** RA: 13:37:00.9192, Dec: -29:51:56.739
- Source Radial Velocity:** 519.100 km/s
- Target Type:** Individual Pointing(s)
- Expected Source Properties:** Peak Continuum Flux Density per Synthesized Beam: 0.00000 Jy, Continuum Linear Polarization: 0.0 per cent, Continuum Circular Polarization: 0.0 per cent, Peak Line Flux Density per Synthesized Beam: 0.00000 Jy, Line Width: 0.00000 km/s, Line Linear Polarization: 0.0 per cent, Line Circular Polarization: 0.0 per cent
- Field Centre Coordinates:** RA [arcsec]: 0.00000, Dec [arcsec]: 0.00000

At the bottom of the interface, there are buttons for 'Add Source', 'Load from File', 'Export to File', 'Clone Source', 'Delete Source', and 'Delete All Sources'.

The Field Setup tab describes the locations in the sky to be observed.

Multiple sources can be specified in this tab. Mosaic observations can also be specified here.

The screenshot displays the ALMA Observing Tool (Cycle 9 Phase 1) interface, specifically the Field Setup tab. The interface is divided into several sections:

- Project Structure:** A tree view on the left showing the project hierarchy, including "Planned Observing", "Science Goal (Science Goal)", "General", "Field Setup", "Spectral Setup", "Calibration Setup", "Control and Performance", and "Technical Justification".
- Editors:** A central panel with tabs for "Spectral", "Spatial", and "Field Setup". The "Field Setup" tab is active.
- Spatial Image:** A central image showing a field of view (FOV) with a red grid overlay. Below the image, the coordinates are 13:38:47.115, -29:52:58.97 (J2000), and the image filename is /georg/lsky3/cache/lsky1566607396946600066.fits.
- FOV Parameters:** A section for configuring the field of view, including:
 - Representative Frequency (Sky): 146.715 GHz
 - Array Type: 12m
 - Antenna Beamsize (HPBW): 38.699 arcsec
 - Show Antenna Beamsize: checked
- Image Query:** A section for querying the image server, including:
 - Image Server: Digitized Sky (Version II) at ESO
 - Image Size(arcmin): 10.0
 - Query button
- Source Configuration (M83):** A detailed panel for configuring the source M83, including:
 - Source Name: M83
 - Source Coordinates: RA 13:37:00.9152, Dec -29:51:56.739
 - Source Radial Velocity: 519.100 km/s
 - Target Type: Individual Pointing(s) @ 1 Rectangular Field
 - Expected Source Properties: Peak Continuum Flux Density per Synthesized Beam: 0.00000 Jy, Continuum Linear Polarization: 0.0 per cent, Continuum Circular Polarization: 0.0 per cent, Peak Line Flux Density per Synthesized Beam: 0.00000 Jy, Line Width: 0.00000 km/s, Line Linear Polarization: 0.0 per cent, Line Circular Polarization: 0.0 per cent
 - Rectangle: Coords Type: Relative, Field Centre Coordinates: Offset(Longitude): 0.00000 arcsec, Offset(Latitude): 0.00000 arcsec, p length: 150.0 arcsec, q length: 150.0 arcsec, Position Angle: 0.00000 deg, Spacing: 0.51093 fraction of antenna beamsize, #Pointings: 12m Array 68

Although source positions and redshifts can be automatically filled in, users need to check that these quantities were filled in correctly or insert new values if appropriate.

ALMA Observing Tool (Cycle 9 (Phase 1)) - Project

File Edit View Tool Search Help

Project Structure

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

Editors

Spectral Spatial Field Setup

Spatial Image

M83

Source

Source Name: M83

Choose a Solar System Object? Name of object: Unspecified

System: ICRS Name of object: Unspecified

Source Coordinates

RA: 13:37:00.9152

Dec: -29:51:56.739

Source Radial Velocity: 519.100 km/s

Target Type: Individual Pointing(s) 1 Rectangular Field

Expected Source Properties

Peak Continuum Flux Density per Synthesized Beam: 0.00000 Jy

Continuum Linear Polarization: 0.0 per cent

Continuum Circular Polarization: 0.0 per cent

Peak Line Flux Density per Synthesized Beam: 0.00000 Jy

Line Width: 0.00000 km/s

Line Linear Polarization: 0.0 per cent

Line Circular Polarization: 0.0 per cent

Rectangle

Coords Type: Relative Absolute

Field Centre Coordinates

Offset(Longitude): 0.00000 arcsec

Offset(Latitude): 0.00000 arcsec

p length: 150.0 arcsec

q length: 150.0 arcsec

Position Angle: 0.00000 deg

Spacing: 0.51093 fraction of antenna beamsize

#Pointings: 12m Array: 68

Buttons: Add Source, Load from File, Export to File, Clone Source, Delete Source, Delete All Sources

The Spectral Setup tab describes how the receivers are set up for the observations.

Multiple spectral and polarization settings are available.

The screenshot displays the ALMA Observing Tool interface. The 'Project Structure' tree on the left shows the 'Spectral Setup' tab selected. The main window is divided into several sections:

- Visualisation:** Contains text explaining the configuration of 16 spectral windows across 4 basebands. It includes two frequency plots: 'Observed Frequency (GHz)' and 'Rest Frequency (GHz)'. Below the plots are controls for 'Overlays' (Receiver Bands, Transmission, DSB Image, Spectral Lines), 'Water Vapour Column Density' (Automatic Choice, Manual Choice), and 'Viewpoint' (Pan to Spectral Window, Zoom to Band, Reset).
- Spectral Type:** Includes radio buttons for 'Spectral Line', 'Single Continuum', and 'Spectral Scan', and checkboxes for 'Produce image sidebands' and 'Polarization products desired'.
- Spectral Setup Errors:** Displays a red error message: 'No spectral window in the list No suitable receiver band for the range [0.0 GHz, 0.0 GHz]'.
- Spectral Line Table:** A table with columns: Fraction, Centre Freq (rest,lsrk), Centre Freq (sky,bar), Transition, Bandwidth, Resolution (smoothed), Spec. Avg, and Representative Window.

Fraction	Centre Freq (rest,lsrk)	Centre Freq (sky,bar)	Transition	Bandwidth, Resolution (smoothed)	Spec. Avg	Representative Window

When the spectral type is set to spectral line, the individual spectral windows need to be created by the user.

When the other spectral types are used, the spectral windows are set based on the user's input.

The screenshot displays the ALMA Observing Tool interface. The 'Project Structure' pane on the left shows a tree view with 'Spectral Setup' selected. The main 'Editors' pane is divided into 'Spectral', 'Spatial', and 'Spectral Setup' tabs, with 'Spectral Setup' active. The 'Spectral Type' section has radio buttons for 'Spectral Line' (selected), 'Single Continuum', and 'Spectral Scan'. Below this, there are checkboxes for 'Produce image sidebands (Bands 9 and 10 only)' and 'Polarization products desired' with radio buttons for 'XX', 'DUAL', and 'FULL'. A red error message states: 'No spectral window in the list No suitable receiver band for the range [0.0 GHz, 0.0 GHz]'. The 'Spectral Line' section contains a table with columns: Fraction, Centre Freq (restIsrk), Centre Freq (sky_bar), Transition, Bandwidth, Resolution (smoothed), Spec Avg, and Representative Window. Below the table are four identical sections for Baseband-1, Baseband-2, Baseband-3, and Baseband-4, each with buttons for 'Add spectral window centred on a spectral line', 'Add spectral window manually', 'Delete', and a checkbox for 'Show image spectral windows'.

When the spectral type is set to spectral line, the individual spectral windows need to be created by the user.

When the other spectral types are used, the spectral windows are set based on the user's input.

ALMA Observing Tool (Cycle 9 (Phase 1)) - Project

File Edit View Tool Search Help

Project Structure

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

Editors

Spectral Spatial Spectral Setup

Spectral Line

Fraction	Centre Freq (rest/hel)	Centre Freq (obs/hel)	Transition	Bandwidth, Resolution (smoothed)	Spec. Avg.	Representative Window
1(Full)	146.96903 GHz	145.71476 GHz	CS v=0 3-2	1875.000 MHz(3831 km/s), 1.129 MHz(2.307 km/s)	2	

Add spectral window centred on a spectral line Add spectral window manually Delete Show Image spectral windows

1(Full)	145.15112 GHz	144.90000 GHz	Continuum 1	1875.000 MHz(3879 km/s), 1.129 MHz(2.336 km/s)	2	
---------	---------------	---------------	-------------	--------------------------------------------------	---	--

Add spectral window centred on a spectral line Add spectral window manually Delete Show Image spectral windows

1(Full)	135.13379 GHz	134.90000 GHz	Continuum 2	1875.000 MHz(4167 km/s), 1.129 MHz(2.509 km/s)	2	
---------	---------------	---------------	-------------	--------------------------------------------------	---	--

Add spectral window centred on a spectral line Add spectral window manually Delete Show Image spectral windows

1(Full)	133.13032 GHz	132.90000 GHz	Continuum 3	1875.000 MHz(4230 km/s), 1.129 MHz(2.547 km/s)	2	
---------	---------------	---------------	-------------	--------------------------------------------------	---	--

Add spectral window centred on a spectral line Add spectral window manually Delete Show Image spectral windows

Representative Frequency

The representative frequency is used in conjunction with the sensitivity entered on the 'Control and Performance' page to estimate the required observing time and to set the size of the antenna beam shown in the 'Spatial Visual' editor. If the transition you are most interested in does not fall in the centre of the chosen spectral window, its frequency can be changed here. The sky equivalents of the representative frequency are shown in the targets table below.

146.96902 GHz

Rest Frequencies

When the spectral type is set to spectral line, the individual spectral windows need to be created by the user.

When the other spectral types are used, the spectral windows are set based on the user's input.

The screenshot displays the ALMA Observing Tool interface. The 'Project Structure' pane on the left shows a tree view with 'Planned Observing' expanded to 'Science Goal (Science Goal)', which includes 'General', 'Field Setup', 'Spectral Setup', 'Calibration Setup', 'Control and Performance', and 'Technical Justification'. The 'Editors' pane on the right is set to 'Spectral Setup' and shows the following configuration:

- Spectral Type:** Single Continuum (selected), Spectral Line, Spectral Scan.
- Produce image sidebands (Bands 9 and 10 only):**
- Polarization products desired:** XX, DUAL, FULL.
- Receiver Band:** 4 [125.0-163.0 GHz] (dropdown menu)
- Reset to Standard Frequency:** (button)
- Sky Frequency:** 145.00000 GHz (dropdown menu)
- Rest Frequency:** 145.251290 GHz (text input)
- Resolution:** Low spectral resolution (TDM), High spectral resolution (FDM).

Below these settings are four baseband configuration tables, each with a 'Show image spectral windows' checkbox:

Fraction	Centre Freq (rest,topo)	Centre Freq (sky,topo)	Transition	Bandwidth, Resolution (smoothed)	Spec Avg.	Representative Window
1(Full)	138.23916 GHz	138.00000 GHz	Single Continuum	1875.000 MHz (4073 km/s), 31.250 MHz (67.888 km/s)	1	

Baseband-2

1(Full)	140.24292 GHz	140.00000 GHz	Single Continuum	1875.000 MHz (4015 km/s), 31.250 MHz (66.918 km/s)	1	
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Baseband-3

1(Full)	150.25995 GHz	150.00000 GHz	Single Continuum	1875.000 MHz (3747 km/s), 31.250 MHz (62.457 km/s)	1	
---------	---------------	---------------	------------------	----------------------------------------------------	---	--

Baseband-4

1(Full)	152.26342 GHz	152.00000 GHz	Single Continuum	1875.000 MHz (3698 km/s), 31.250 MHz (61.635 km/s)	1	
---------	---------------	---------------	------------------	----------------------------------------------------	---	--

The spectral line catalogue will appear when either overlaying spectral lines in the spectrum plot or defining spectral windows to observe.

Create spectral windows centred on spectral lines

Transition Filter
 CS v=0*
 e.g. CO²⁻¹ or ¹³Cv=10
 Include description

Frequency Filters
ALMA Band
 1 2 3 4 5 6 7 8 9 10

Sky Frequency (GHz)
 Min Max

Receiver/Back End Configuration
 All lines
 Potentially selectable lines
 Lines in defined spws
 Filtering unobservable lines

Upper-state Energy (K)
 Min Max

Molecule Filter / Environment
 Show

Can't find the transition you're looking for in the offline pool? Find more in the online Splatalogue.

Transitions matching your filter settings:
 (double-click column header for primary sort, single-click subsequent columns for secondary sorting. Single clicks will reverse sort order of already selected columns.)

Transition	Description	Rest Frequency	Sky Frequency	Upper-state Energy	Lowest Intensity	Sij μ ²	Catalog
CS v=0 2-1	Carbon Monosulfide	97.980953 GHz	97.811443 GHz	7.053 K	6.94 7.668 D ^a		Offline
CS v=0 3-2	Carbon Monosulfide	146.969025 GHz	146.714763 GHz	14.106 K	8.11 11.501 D ^a		Offline
CS v=0 4-3	Carbon Monosulfide	195.954211 GHz	195.615203 GHz	23.511 K	3.3 15.287 D ^a		Offline
CS v=0 5-4	Carbon Monosulfide	244.935556 GHz	244.511809 GHz	35.266 K	5.5 19.169 D ^a		Offline
CS v=0 6-5	Carbon Monosulfide	293.912091 GHz	293.403613 GHz	49.371 K	3.3 23.003 D ^a		Offline
CS v=0 7-6	Carbon Monosulfide	342.882857 GHz	342.289658 GHz	65.827 K	9.65 26.836 D ^a		Offline
CS v=0 8-7	Carbon Monosulfide	391.846893 GHz	391.168984 GHz	84.634 K	30.67 D ^a		Offline
CS v=0 9-8	Carbon Monosulfide	440.803237 GHz	440.040632 GHz	105.788 K	34.504 D ^a		Offline
CS v=0 10-9	Carbon Monosulfide	489.750927 GHz	488.903641 GHz	129.293 K	11.7 38.338 D ^a		Offline
CS v=0 13-12	Carbon Monosulfide	636.532466 GHz	635.431243 GHz	213.895 K	29.9 49.839 D ^a		Offline
CS v=0 14-13	Carbon Monosulfide	685.435929 GHz	684.250101 GHz	246.79 K	26.53 67.3 D ^a		Offline
CS v=0 17-16	Carbon Monosulfide	832.061708 GHz	830.62212 GHz	359.552 K	57.2 85.174 D ^a		Offline
CS v=0 18-17	Carbon Monosulfide	880.905560 GHz	879.381563 GHz	401.829 K	15.3 69.008 D ^a		Offline
CS v=0 19-18	Carbon Monosulfide	929.732106 GHz	928.123637 GHz	446.448 K	72.842 D ^a		Offline

Add to spectral window list

Spectral windows in this baseband (maximum of four)

Transition	Description	Rest Frequency	Sky Frequency
------------	-------------	----------------	---------------

Remove spectral window(s)

This catalogue can be searched using many criteria and is a generally useful reference.

The catalogue is also available on the web at

<https://splatalogue.online/>

Create spectral windows centred on spectral lines

Transition Filter
CS v=0*

Frequency Filters
ALMA Band
Sky Frequency (GHz)
Min 35 Max 950

Receiver/Back End Configuration
All lines
Potentially selectable lines
Lines in defined spws
Filtering unobservable lines

Upper-state Energy (K)
Min 0 Max 0

Molecule Filter / Environment
Show all atoms and molecules

Can't find the transition you're looking for in the offline pool? Find more in the online Splatalogue.
Search Online
Reset Filters

Transitions matching your filter settings:
(double-click column header for primary sort, single-click subsequent columns for secondary sorting. Single clicks will reverse sort order of already selected columns.)

Transition	Description	Rest Frequency	Sky Frequency	Upper-state Energy	Losvs Intensity	Sij μ^2	Catalog
CS v=0 2-1	Carbon Monosulfide	97.980953 GHz	97.811443 GHz	7.053 K	6.94	7.668 D ^a	Offline
CS v=0 3-2	Carbon Monosulfide	146.969025 GHz	146.714763 GHz	14.106 K	8.11	15.501 D ^a	Offline
CS v=0 4-3	Carbon Monosulfide	195.954211 GHz	195.615203 GHz	23.511 K	3.3	15.287 D ^a	Offline
CS v=0 5-4	Carbon Monosulfide	244.935556 GHz	244.511809 GHz	35.266 K	5.5	19.169 D ^a	Offline
CS v=0 6-5	Carbon Monosulfide	293.912091 GHz	293.403613 GHz	49.371 K	3.3	23.003 D ^a	Offline
CS v=0 7-6	Carbon Monosulfide	342.882857 GHz	342.289658 GHz	65.827 K	9.65	26.836 D ^a	Offline
CS v=0 8-7	Carbon Monosulfide	391.846893 GHz	391.168984 GHz	84.634 K	30.67	D ^a	Offline
CS v=0 9-8	Carbon Monosulfide	440.803237 GHz	440.040632 GHz	105.788 K	34.504	D ^a	Offline
CS v=0 10-9	Carbon Monosulfide	489.750927 GHz	488.903641 GHz	129.293 K	11.7	38.338 D ^a	Offline
CS v=0 13-12	Carbon Monosulfide	636.532466 GHz	635.431243 GHz	213.895 K	29.9	49.839 D ^a	Offline
CS v=0 14-13	Carbon Monosulfide	685.435929 GHz	684.250101 GHz	246.79 K	26.5	53.673 D ^a	Offline
CS v=0 17-16	Carbon Monosulfide	832.061708 GHz	830.62212 GHz	359.552 K	57.2	65.174 D ^a	Offline
CS v=0 18-17	Carbon Monosulfide	880.905560 GHz	879.381563 GHz	401.829 K	15.3	69.008 D ^a	Offline
CS v=0 19-18	Carbon Monosulfide	929.732106 GHz	928.123637 GHz	446.448 K	72.842	D ^a	Offline

Add to spectral window list

Spectral windows in this baseband (maximum of four)

Transition	Description	Rest Frequency	Sky Frequency
------------	-------------	----------------	---------------

Remove spectral window(s)

Cancel Ok

The plot at the top of the window will be updated as the spectral windows are set.

If the yellow bands do not appear, the spectral windows are not configured correctly.

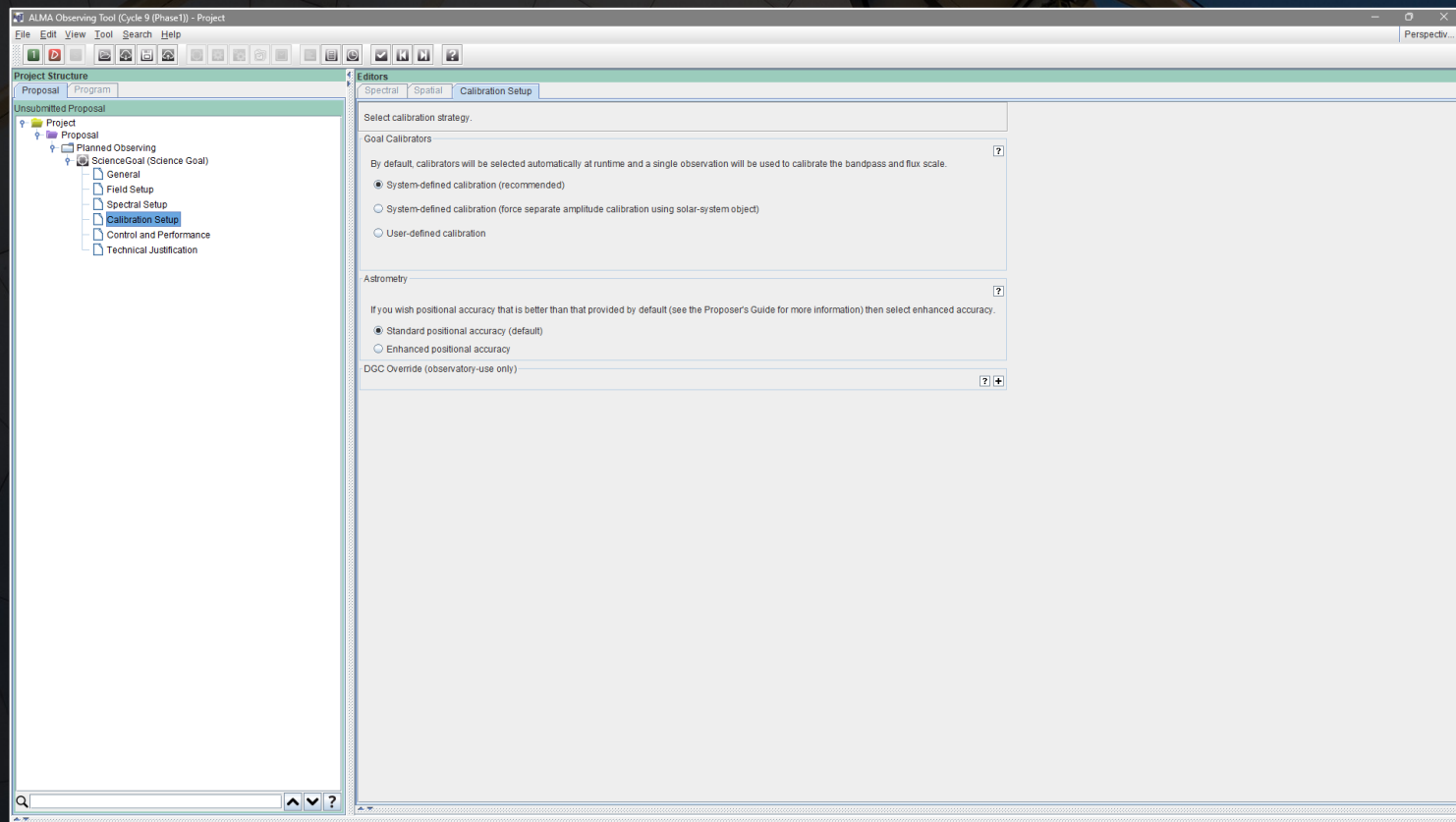
The screenshot displays the ALMA Observing Tool interface. The main window is titled "ALMA Observing Tool (Cycle 9 (Phase 1)) - Project". The interface is divided into several sections:

- Project Structure:** A tree view on the left showing the project hierarchy: Project > Planned Observing > Science Goal (Science Goal) > General > Field Setup > Spectral Setup > Calibration Setup > Control and Performance > Technical Justification.
- Editors:** A tabbed interface with "Spectral Setup" selected. It contains a "Visualisation" section with a plot of Observed Frequency (GHz) vs Rest Frequency (GHz). The plot shows several yellow bands labeled "Continuum 2" and "Continuum 3", and a blue band labeled "04". A vertical line is labeled "LO1".
- Overlays:** A section with checkboxes for "Receiver Bands", "Transmission", "DSB Image", and "Spectral Lines".
- Water Vapour Column Density:** A section with radio buttons for "Automatic Choice" and "Manual Choice", with a value of "2.748mm (6th Octile)".
- Viewport:** Buttons for "Pan to Spectral Window", "Zoom to Band", and "Reset".
- Spectral Type:** Radio buttons for "Spectral Line", "Single Continuum", and "Spectral Scan".
- Spectral Setup Errors:** A section for reporting errors.
- Spectral Line:** A table showing the configuration for a spectral line.

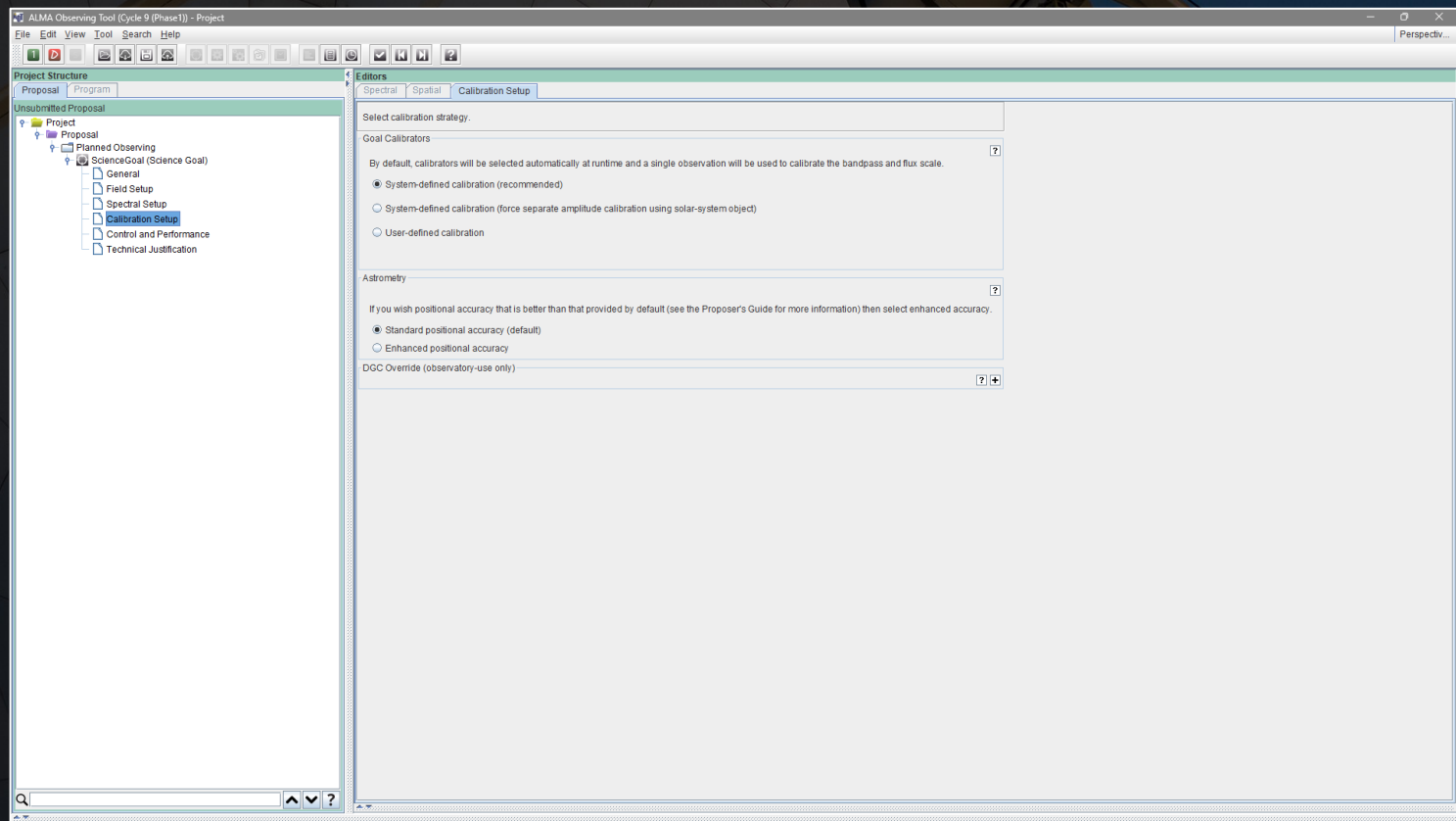
Fraction	Centre Freq (rst, hel)	Centre Freq (sty, hel)	Transition	Bandwidth, Resolution (smoothed)	Spec Avg	Representative Window
1(Full)	146.96903 GHz	146.71476 GHz	CS v=0 3-2	1875.000 MHz (3831 kms), 1.129 MHz (2.307 kms)	2	

The Calibration Setup tab is used to create specific calibration settings for the observations.

For most programs, the default settings are generally all that is needed.



Do not select an option other than system-defined calibration without seeking expert help.



The Control and Performance tab is used to specify what sensitivity and angular resolution is required for the project.

The options here cannot be set until the Field Setup and Spectral Setup are set.

The screenshot displays the ALMA Observing Tool interface. The main window is titled "ALMA Observing Tool (Cycle 9 (Phase 1)) - Project". The interface is divided into several panels:

- Project Structure:** A tree view on the left showing the project hierarchy. The "Control and Performance" tab is selected under the "Science Goal (Science Goal)" folder.
- Editors:** A panel on the right with three tabs: "Spectral", "Spatial", and "Control and Performance". The "Control and Performance" tab is active.

The "Control and Performance" tab contains the following configuration information:

These parameters are used to control various aspects of the observations, including the required antenna configurations and integration times.

Configuration Information

Parameter	12m	7m	TP
Antenna Beamsize (1.13" A/D)	39.689 arcsec	68.038 arcsec	
Number of Antennas	43	10	3
Longest baseline	0.049 km	0.161 km	16.197 km
Synthesized beamsize	8.523 arcsec	2.313 arcsec	0.029 arcsec
Shortest baseline	0.009 km	0.015 km	0.256 km
Maximum recoverable scale	45.617 arcsec	19.554 arcsec	0.339 arcsec

Desired Performance

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

0.5 arcsec to 2.5 arcsec

Largest Angular Structure in source: 45.0 arcsec

Desired sensitivity per pointing: 0.01 mJy equivalent to 0.090885 mK @ 2.50" and 0.0022721 K @ 0.500"

Bandwidth used for Sensitivity: AggregateBandWidth Frequency Width 7.439763 GHz

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

Science Goal Breakdown: time estimate, clustering, beam and configurations:

Simultaneous 12-m and ACA observations: Yes No

Are the observations time-constrained?: Yes No

If a desired angular resolution is needed, that should be specified here. **Using the Range option is strongly recommended.**

The screenshot displays the ALMA Observing Tool interface. On the left, the 'Project Structure' tree shows the 'Control and Performance' section selected. The main window is titled 'Editors' and contains the 'Control and Performance' configuration page. This page includes sections for 'Configuration Information' and 'Desired Performance'. The 'Desired Performance' section features radio buttons for 'Single', 'Range', 'Any', and 'Standalone ACA', with 'Range' selected. Below these are input fields for angular resolution (0.5 to 2.5 arcsec), largest angular structure (45.0 arcsec), and desired sensitivity per pointing (0.01 mJy). A 'Bandwidth used for Sensitivity' dropdown is set to 'AggregateBandWidth'. At the bottom, there are checkboxes for 'Override OT's sensitivity-based time estimate', 'Simultaneous 12-m and ACA observations', and 'Are the observations time-constrained?'. A 'Planning and Time Estimate' button is also present.

ALMA Observing Tool (Cycle 9 (Phase 1)) - Project

File Edit View Tool Search Help

Project Structure

Unsubmitted Proposal

Project

Planned Observing

ScienceGoal (Science Goal)

General

Field Setup

Spectral Setup

Calibration Setup

Control and Performance

Technical Justification

Editors

Spectral Spatial Control and Performance

These parameters are used to control various aspects of the observations, including the required antenna configurations and integration times.

Configuration Information

Antenna Beamsize (1.13" A/D) 12m 39.689 arcsec 7m 68.038 arcsec

Number of Antennas 12m 43 7m 10 TP 3

ACA 7m configuration Most compact 12m configuration Most extended 12m configuration

Longest baseline 0.049 km 0.161 km 16.197 km

Synthesized beamsize 8.523 arcsec 2.313 arcsec 0.029 arcsec

Shortest baseline 0.009 km 0.015 km 0.256 km

Maximum recoverable scale 45.617 arcsec 19.554 arcsec 0.339 arcsec

Desired Performance

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

0.5 arcsec to 2.5 arcsec

Largest Angular Structure in source 45.0 arcsec

Desired sensitivity per pointing 0.01 mJy equivalent to 0.090885 mK @ 2.50" and 0.0022721 K @ 0.500"

Bandwidth used for Sensitivity AggregateBandWidth Frequency Width 7.439793 GHz

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

Science Goal Breakdown: time estimate, clustering, beam and configurations

Simultaneous 12-m and ACA observations Yes No

Are the observations time-constrained? Yes No

For observations that only need detections, **using the Any option is strongly recommended**. Alternately, the standalone ACA can be used, particularly for bright sources.

The screenshot displays the ALMA Observing Tool (Cycle 9 Phase 1) interface. The left sidebar shows the 'Project Structure' with a tree view including 'Project', 'Planned Observing', 'ScienceGoal (Science Goal)', 'General', 'Field Setup', 'Spectral Setup', 'Calibration Setup', 'Control and Performance', and 'Technical Justification'. The main window is titled 'Editors' and has tabs for 'Spectral', 'Spatial', and 'Control and Performance'. The 'Control and Performance' tab is active, showing configuration parameters for observations. The 'Configuration Information' section includes fields for 'Antenna Beamsize (1.13 * A / D)' (12m: 39.689 arcsec, 7m: 68.038 arcsec), 'Number of Antennas' (12m: 43, 7m: 10, TP: 3), and 'Longest baseline' (0.049 km, 0.161 km, 2.517 km). The 'Desired Performance' section features radio buttons for 'Desired Angular Resolution (Synthesized Beam)' (Single, Range, Any, Standalone ACA), with 'Any' selected. It also shows 'Desired sensitivity per pointing' (0.01000 mJy, equivalent to 0.10615 mK and 0.012873 K) and 'Bandwidth used for Sensitivity' (AggregateBandWidth, Frequency Width: 7.439763 GHz). A 'Planning and Time Estimate' button is visible, along with options to 'Override OT's sensitivity-based time estimate' (Yes/No) and 'Are the observations time-constrained?' (Yes/No).

If the source is extended and if that extended emission is important for the science, then specifying the largest angular structure is important. This will determine whether the ACA or the total power arrays are needed. (Note that total power continuum observations are currently not possible.)

ALMA Observing Tool (Cycle 9 (Phase 1)) - Project

File Edit View Tool Search Help

Project Structure

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

Editors

Spectral Spatial Control and Performance

These parameters are used to control various aspects of the observations, including the required antenna configurations and integration times.

Configuration Information

Antenna Beamsize (1.13" A/D) 12m 39.689 arcsec 7m 68.038 arcsec

Number of Antennas 12m 43 7m 10 TP 3

	ACA 7m configuration	Most compact 12m configuration	Most extended 12m configuration
Longest baseline	0.049 km	0.161 km	16.197 km
Synthesized beamsize	8.523 arcsec	2.313 arcsec	0.029 arcsec
Shortest baseline	0.009 km	0.015 km	0.256 km
Maximum recoverable scale	45.617 arcsec	19.554 arcsec	0.339 arcsec

Desired Performance

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

0.5 arcsec to 2.5 arcsec

Largest Angular Structure in source 45.0 arcsec

Desired sensitivity per pointing 0.01 mJy equivalent to 0.090885 mK @ 2.50" and 0.0022721 K @ 0.500"

Bandwidth used for Sensitivity AggregateBandWidth Frequency Width 7.439763 GHz

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

Science Goal Breakdown: time estimate, clustering, beam and configurations

Simultaneous 12-m and ACA observations Yes No

Are the observations time-constrained? Yes No

ALMA is not like other telescopes in that it does not allocate “time” to observing proposals.

ALMA will instead observe the targets until it achieves the desired sensitivity.

The screenshot displays the ALMA Observing Tool interface, titled "ALMA Observing Tool (Cycle 9 (Phase 1)) - Project". The interface is divided into two main sections: "Project Structure" on the left and "Editors" on the right.

Project Structure: A tree view showing the project hierarchy. The "Control and Performance" folder is selected and highlighted in blue.

Editors: The "Control and Performance" editor is active, showing various configuration parameters for observations. The parameters are organized into several sections:

- Configuration Information:** Parameters for antenna beam sizes, number of antennas, and baselines for different configurations (ACA 7m, Most compact 12m, Most extended 12m).
- Desired Performance:** Parameters for angular resolution, largest angular structure, and desired sensitivity per pointing.
- Bandwidth used for Sensitivity:** Parameters for aggregate bandwidth and frequency width.
- Override OT's sensitivity-based time estimate (must be justified):** A radio button set with "No" selected.
- Science Goal Breakdown:** Parameters for time estimate, clustering, beam and configurations, and simultaneous observations.

The "Desired Performance" section includes the following details:

- Desired Angular Resolution (Synthesized Beam): Single Range Any Standalone ACA
- Resolution range: 0.5 arcsec to 2.5 arcsec
- Largest Angular Structure in source: 45.0 arcsec
- Desired sensitivity per pointing: 0.01 mJy equivalent to 0.090885 mK @ 2.50" and 0.0022721 K @ 0.500"
- Bandwidth used for Sensitivity: AggregateBandWidth, Frequency Width 7.439763 GHz

The tab has a button that can be used to check the time needed for an observation. While minimizing the observing time while achieving a desired sensitivity is important, keep in mind that **ALMA does not allocate “time” to observing proposals.**

Planning and Time Estimate

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	0.01000 mJy
Bandwidth used for sensitivity	7.440 GHz
Representative frequency (sky, first source)	148.715 GHz

Estimated Total time for Science Goal 7.17 h

Cluster 1

Source Name	RA	Dec	Velocity
M83	13.37.00.9192	-29.51.56.739	519.100 km/s

Possible Configuration Combinations

12-m (1)	12-m (2)	7-m	TP	Nominal Beam(*)	Max expected axial ratio
C-1	None	Yes	No	2.151 x 2.488	1.5
C-2	None	Yes	No	1.461 x 1.69	1.5
C-3	None	Yes	No	0.879 x 1.065	1.5

Input Parameters

Precipitable water vapour (all sources)	2.748mm (6th Octile)
-----------------------------------------	----------------------

Time required for 12m (1) [C-3]

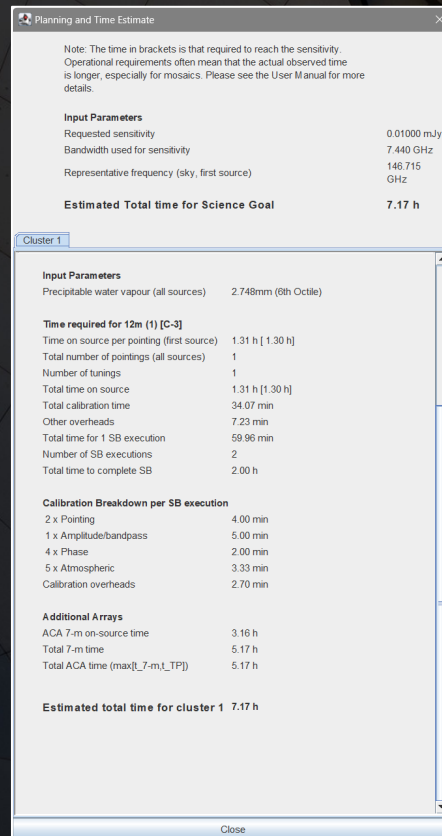
Time on source per pointing (first source)	1.31 h [1.30 h]
Total number of pointings (all sources)	1
Number of tunings	1
Total time on source	1.31 h [1.30 h]
Total calibration time	34.07 min
Other overheads	7.23 min
Total time for 1 SB execution	59.96 min
Number of SB executions	2
Total time to complete SB	2.00 h

Calibration Breakdown per SB execution

2 x Pointing	4.00 min
1 x Amplitude/bandpass	5.00 min
4 x Phase	2.00 min
5 x Atmospheric	3.33 min
Calibration overheads	2.70 min

Close

The tab has a button that can be used to check the time needed for an observation. While minimizing the observing time while achieving a desired sensitivity is important, keep in mind that **ALMA does not allocate “time” to observing proposals.**



Planning and Time Estimate

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	0.01000 mJy
Bandwidth used for sensitivity	7.440 GHz
Representative frequency (sky, first source)	148.715 GHz

Estimated Total time for Science Goal 7.17 h

Cluster 1

Input Parameters

Precipitable water vapour (all sources)	2.748mm (6th Octile)
-----------------------------------------	----------------------

Time required for 12m (1) [C-3]

Time on source per pointing (first source)	1.31 h [1.30 h]
Total number of pointings (all sources)	1
Number of tunings	1
Total time on source	1.31 h [1.30 h]
Total calibration time	34.07 min
Other overheads	7.23 min
Total time for 1 SB execution	59.96 min
Number of SB executions	2
Total time to complete SB	2.00 h

Calibration Breakdown per SB execution

2 x Pointing	4.00 min
1 x Amplitude/bandpass	5.00 min
4 x Phase	2.00 min
5 x Atmospheric	3.33 min
Calibration overheads	2.70 min

Additional Arrays

ACA 7-m on-source time	3.16 h
Total 7-m time	5.17 h
Total ACA time (max[L_7-m_L_TPI])	5.17 h

Estimated total time for cluster 1 7.17 h

Close

The Technical Justification tab is a place where a justification for the sensitivity goal, requested angular resolutions, and spectral window setup should be added.

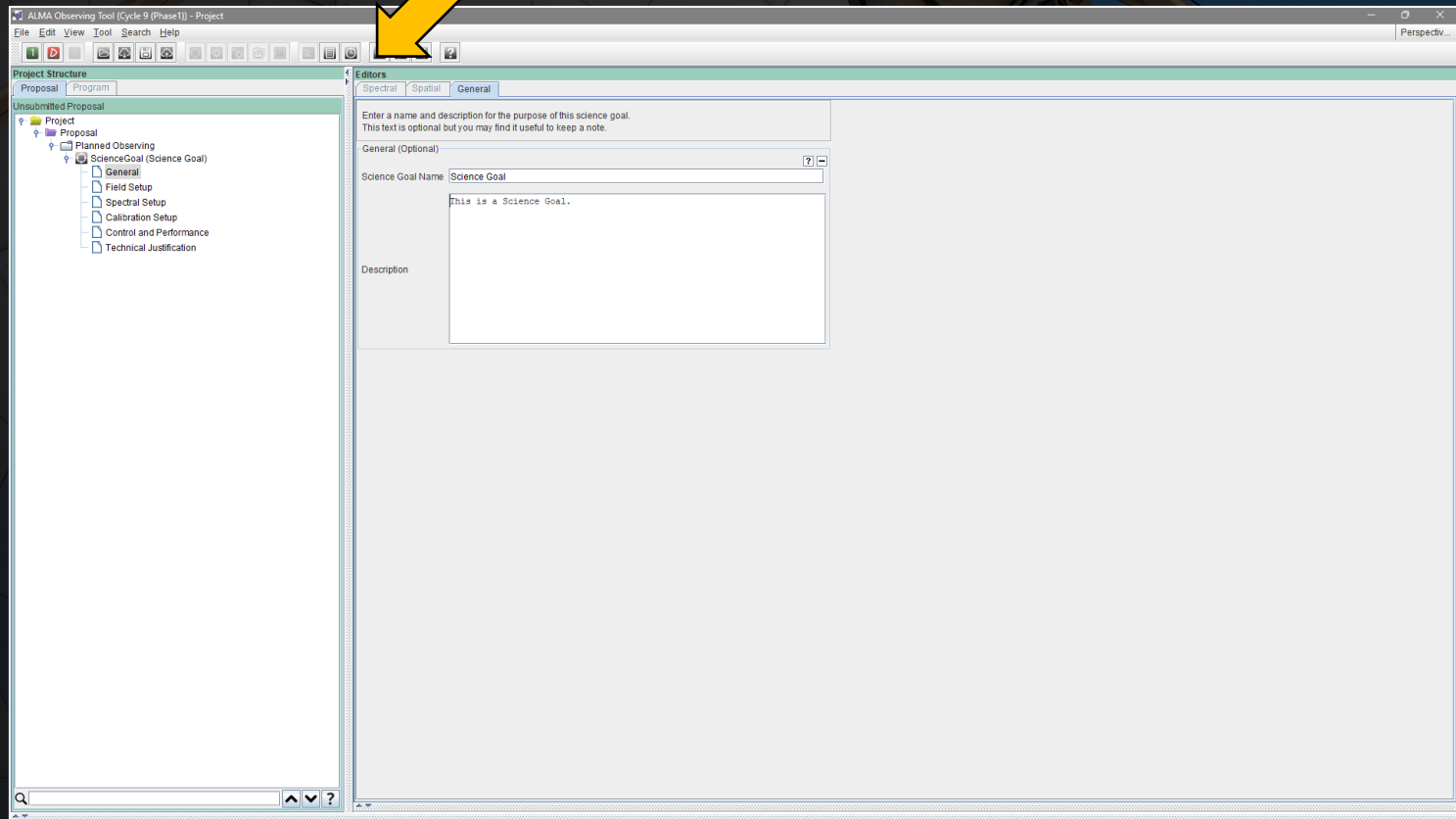
This information does not need to be in the science case.

The screenshot displays the ALMA Observing Tool interface. The window title is "ALMA Observing Tool (Cycle 9 (Phase 1)) - Project". The interface is divided into several panes:

- Project Structure:** A tree view on the left showing the project hierarchy. The "Technical Justification" tab is selected under the "ScienceGoal (Science Goal)" folder.
- Editors:** The main editing area on the right, currently showing the "Technical Justification" tab. It contains three sections:
 - Sensitivity:** A text area for justification. It displays: "Requested RMS over 7.440 GHz is 10.00 uJy". Below this, it shows: "Achieved RMS over the total 7.440 GHz bandwidth is 9.97 uJy, 0.09 mK-2.27 mK". For a continuum flux density of 0.00 Jy, 0.00 mK-0.00 mK, the achieved SIN is 0.0. A note states: "Note that one or more of the SIN estimates are < 3. Please double-check the RMS and/or line fluxes entered and/or address the issue below." A text box for justification is provided below.
 - Imaging:** A text area for justification. It displays: "Requested angular resolution 2.50 arcsec - 500.00 mas" and "Requested Largest Angular Scale 45.00 arcsec". A text box for justification is provided below.
 - Correlator configuration:** A text area for justification. It displays: "Justify your correlator set-up with particular reference to the number of spectral resolution elements per line width. You may want to consider spectral averaging to lower the data rate". A text box for justification is provided below.

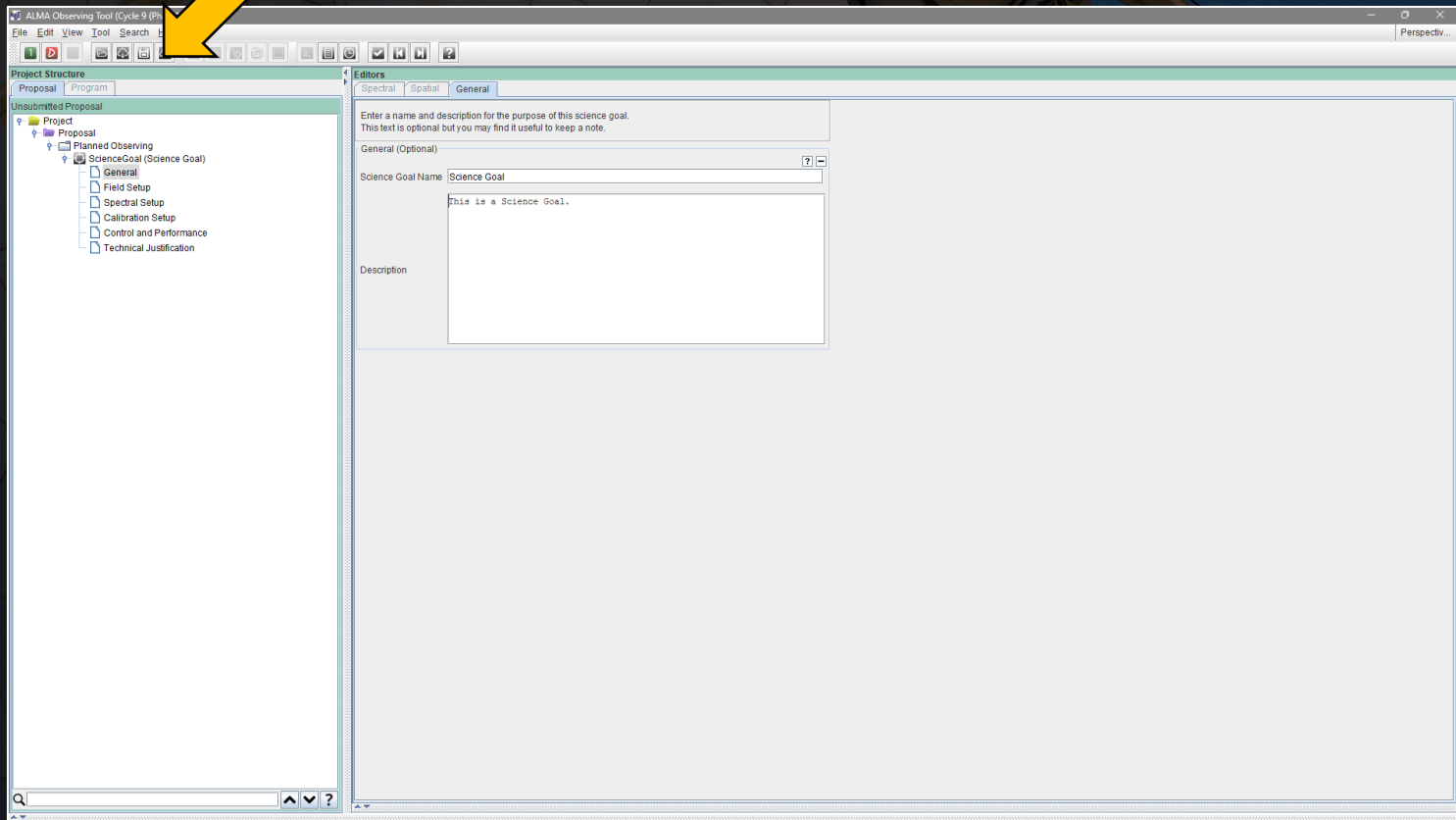
Once a proposal is created, it should be validated using the option in the File menu or the button in the button bar.

After the proposal is validated, it can be submitted using another option in the File menu.



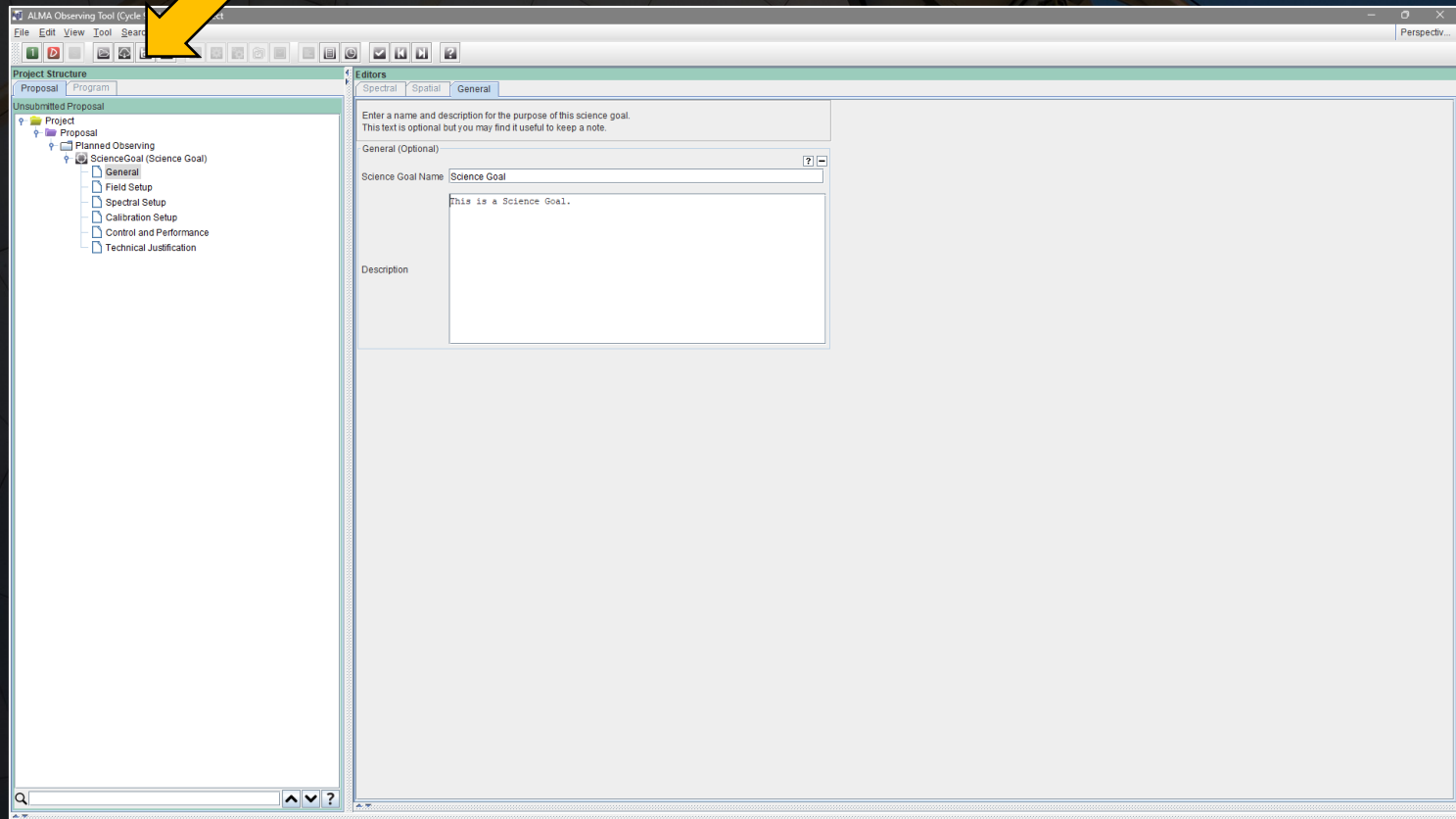
Once a proposal is created, it should be validated using the option in the File menu or the button in the button bar.

After the proposal is validated, it can be submitted using another option in the File menu.



The proposal can be saved as an aot file at any time using the save options in the File menu or button bar.

Additionally, the proposal can be exported as a PDF.



Some recommendations on setting up observations:

- Make sure all Co-Is have registered for an account with ALMA (or ESO) so that they can be listed on the proposal.
- Check the source coordinates, velocities and/or redshifts, and spectral settings before proposal submission. These can be updated later, but if more changes need to be made, more errors can be introduced.
- Use at least four spectral windows. Any spectral window not covering a line of scientific interest can be used for serendipitous continuum and spectral line detection.
- Use 1920 channels per baseband. The extra channels provide extra spectral resolution if needed, and if the higher resolution is not needed, the channels can be averaged together after observing to improve sensitivity.
- Do not use 3840 channels per spectral window (unless you know what you are doing). The effective spectral resolution will still be equivalent to 1920 channels.
- Do not place important spectral lines near the edges of spectral windows where the sensitivity of the detectors decreases.

Some recommendations on setting up observations:

- Do not try to gain sensitivity by overlapping the spectral windows. The instrument doesn't work that way.
- Do not change anything under Calibration Setup unless you know what you are doing.
- Do not specify a single angular resolution unless you absolutely need to. A program that specifies a range is more likely to be observed.
- Use “Any” for the desired angular resolution if you only need to detect the source.
- Do not forget to account for extended source emission in terms of uv coverage.
- Do not forget to account for extent of the source emission when estimating the peak surface brightness.

A large satellite dish antenna structure is shown against a dark blue sky. The dish is composed of a complex metal truss structure and a large, curved, perforated metal surface. The structure is illuminated from the side, creating strong highlights and deep shadows. The sky is a uniform, dark blue color.

A proposal can be resubmitted multiple times before the proposal deadline.

After the deadline, the proposal can no longer be changed until the review process is completed.