ALMA Proposal Preparation:
The Observing Tool

Viviana Casasola

Italian ALMA Regional Centre (ARC)
INAF-Istituto di Radioastronomia

In collaboration with ARC's Team

ASTROCHEMISTRY WITH ALMA
Bologna, June 17th, 2011

Outline

- Early Science Cycle-0: Capabilities
- Glossary
- Early Science Cycle-0: Constraints
- Phases of Proposal Submission (Phase I and Phase II)
- ALMA SCIENCE PORTAL
- ALMA Observing Tool Structure

ALMA Early Science (ES) Cycle 0

Timeline

- Call Cycle O: 30 March 2011
- Deadline: 30 June 2011 (**~2 weeks**)
- Start of ALMA Cycle 0 observing: Autumn 2011
- End of ALMA Cycle O: 30 June 2012

ES Capabilities

- 16 antennas
- 2 Configurations: compact (18m - 125m) -- extended (36m - 400m)
- Single field interferometry plus mosaics with up to 50 pointings
- 4 Bands: B3 (3mm), B6 (1mm), B7 (0.85mm), and B9 (0.45mm)
- 14 spectral/continuum correlator modes available for Cycle 0
- The ~30% of the available time for the first call, **~500-600 hrs**
- Typical ES project should be **4-10 hrs** and delivers results

ES-Cycle 0 Properties

R. Neri's Lectures for definitions of Angular Resolution, FOV, ...

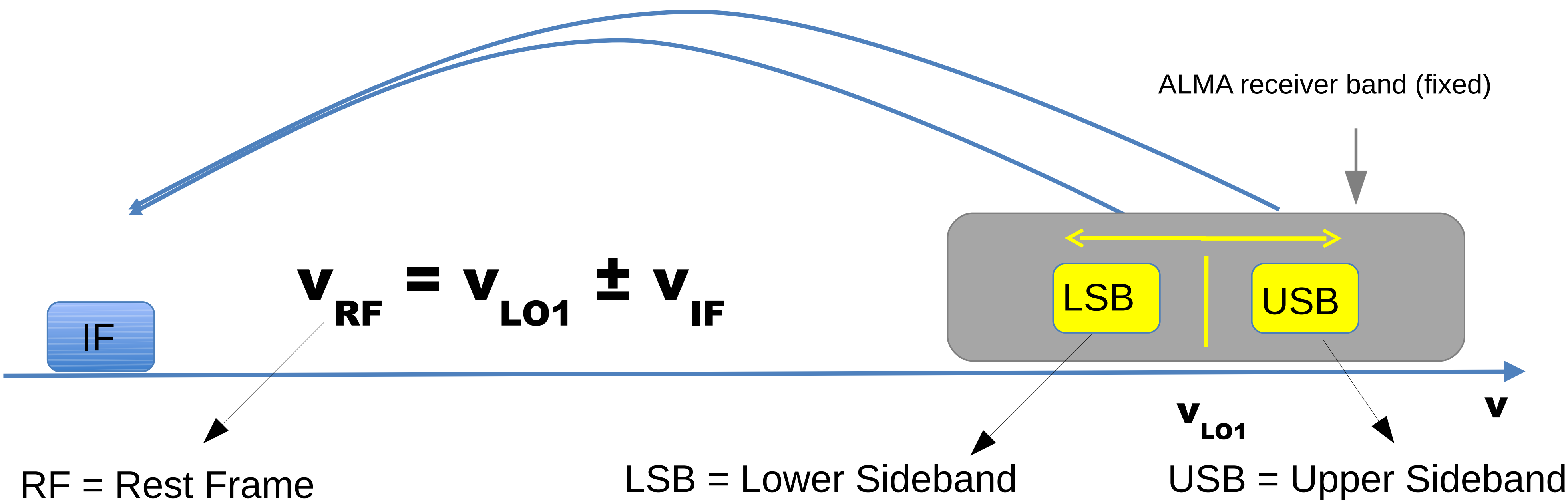
5σ, 1h, Continuum, 8 GHz per Pol, Dual Pol.

3σ, 4h, Line, 1 km/s Sp. Res., Dual Pol.

Band	Frequency [GHz]	Angular Resolution ["]	Maximum Scale ["]	T_{bc} [mK]	Flux [mJy]	T_{bl} [K]	Field of View ["]
Properties of the Compact Configuration (baselines of ~18 m to ~125 m)							
3	100	5.3	21	0.65	0.14	0.030	62
6	230	2.3	9	1.0	0.20	0.029	27
7	345	1.55	6	1.8	0.37	0.043	18
9	675	0.80	3	15	3.2	0.27	9
Properties of the Extended Configuration (baselines of ~36 m to ~400 m)							
3	100	1.56	10.5	7.6	0.14	0.35	62
6	230	0.68	4.5	11	0.20	0.34	27
7	345	0.45	3.0	20	0.37	0.50	18
9	675	0.23	1.5	175	3.2	3.1	9

Sidebands

- Most radio astronomy receivers have 2 sidebands: caused by mixing the sky signal with a local oscillator (LO)
- Sidebands are mapped to a lower frequency band
  i. IF (Intermediate Frequency) range sets width and separation of sidebands
  ii. Differs for different bands
- Varying LO1 causes the sidebands to move
- **8 GHz bandwidth is available**



Sidebands

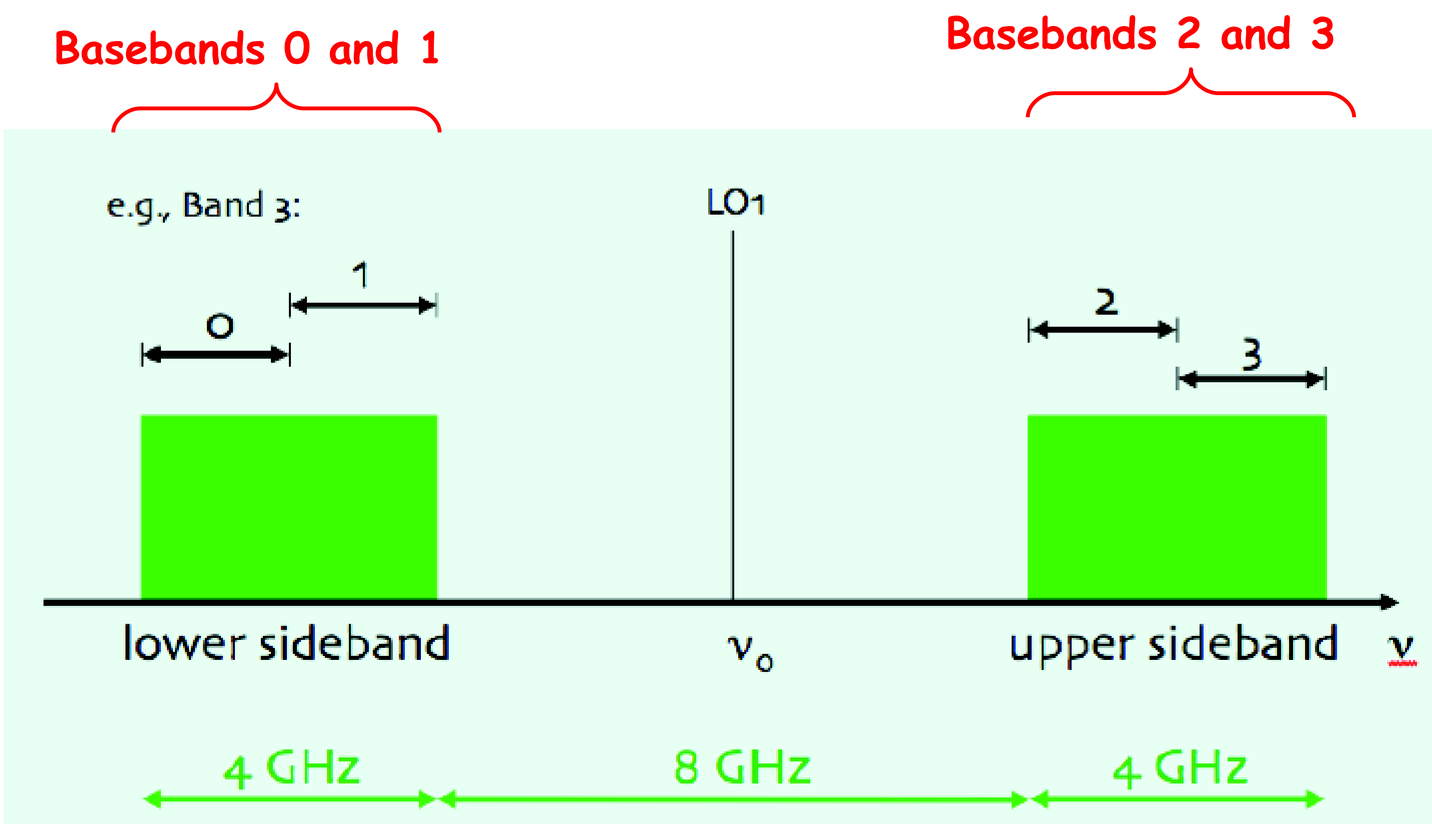
- ALMA usually allows both sidebands (LSB & USB) to be used

- ALMA has two kinds of receivers with two sidebands

    i. Sidebands Separating (2SB – from B3 to B8)
    ii. Double Sideband (DSB, B9 and B10)
    iii. Both are present at ES-Cycle 0

Basebands

- A 2 GHz wide portion of the available signal which is digitized at the antenna
- The 4 available Basebands (0, 1, 2, and 3) can be placed in one sideband or distributed between the 2 Sidebands
- The maximum available 8 GHz bandwidth is achieved when the 4 basebands are chosen not to overlap



Spectral Window (SPW)

- A Spectral Window is a frequency subrange of a Baseband

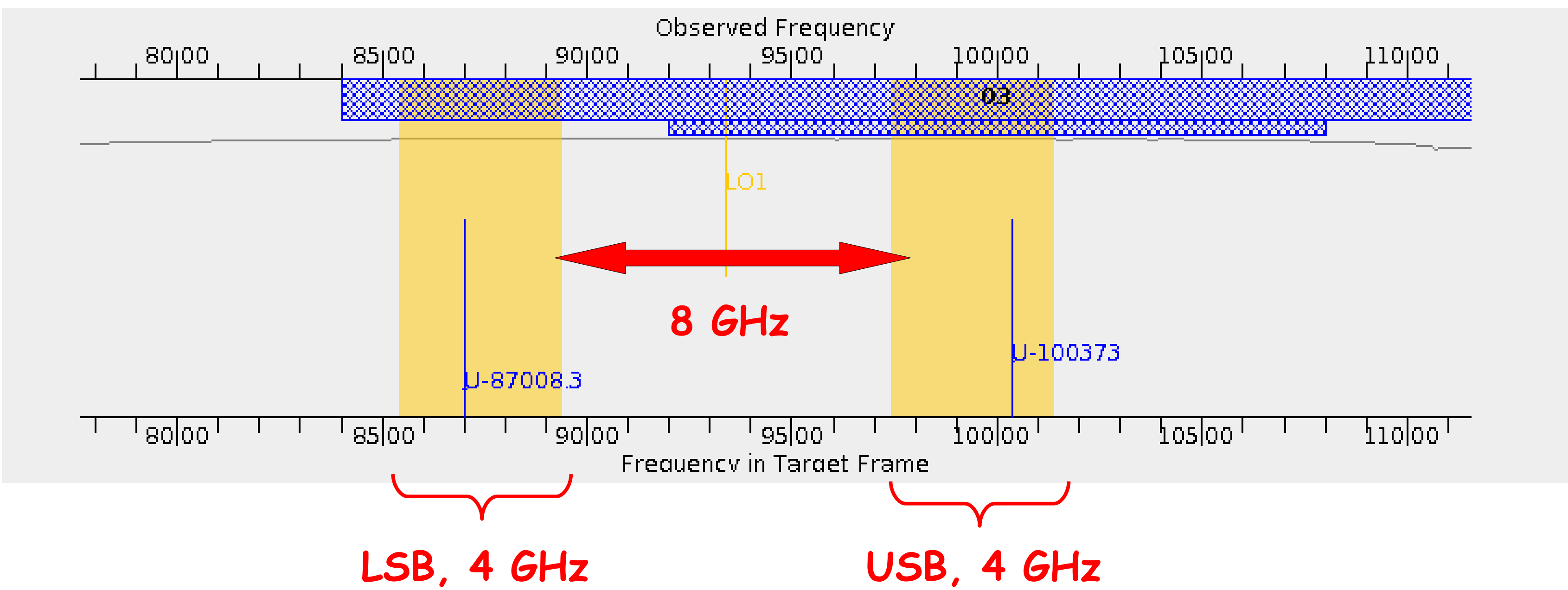
- The Spectral Windows are the "the data" (e.g., molecular lines)

- In Early Science, only one Spectral Window per Baseband is available and all of the Spectral Windows in all Basebands must use the same Bandwidth and Resolution

2SB receivers (B3-B8)
For ES B3, B6, and B7

- Sidebands are separated in the receiver
- Sidebands are generally 4 GHz wide and separated by 8 GHz

B3 (84-116 GHz)

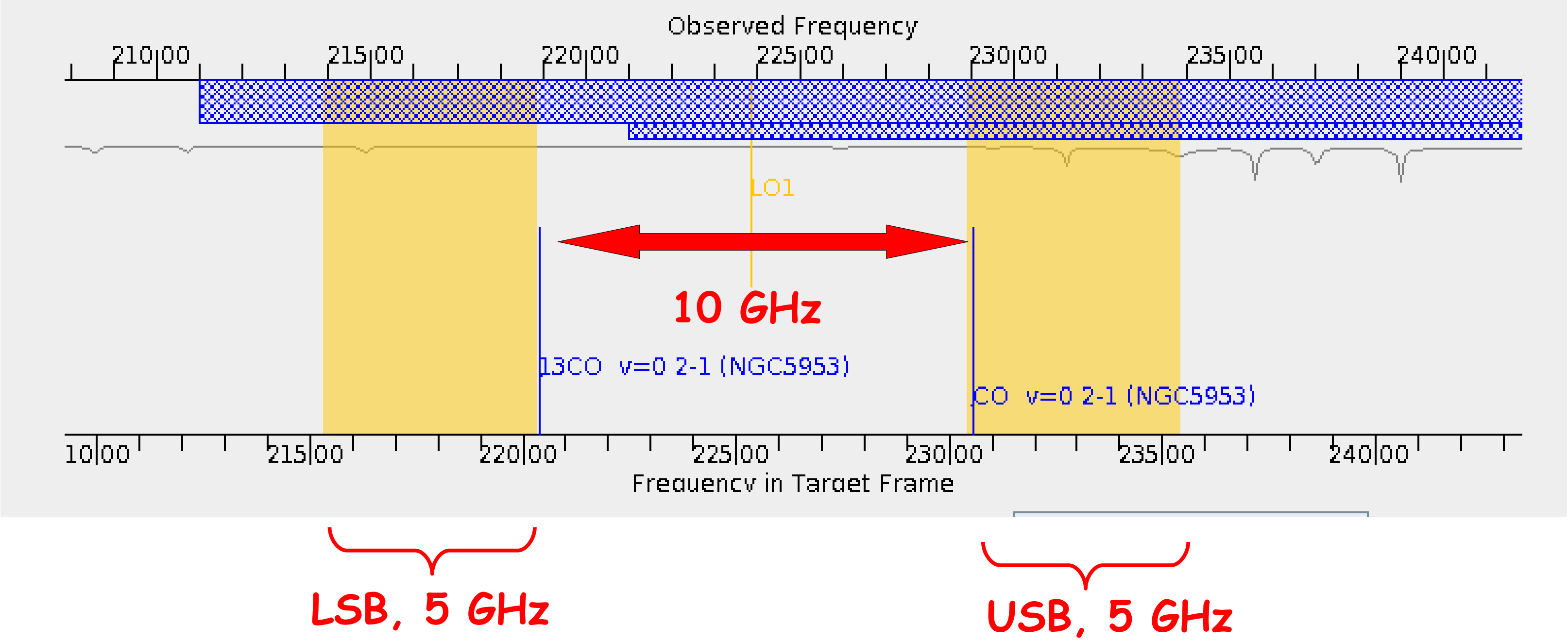


B7 (275-373 GHz), same properties

2SB receiver (B6)

- But in Band 6 sidebands are 5 GHz wide and separated by 10 GHz (to allow simultaneous detection of ^{12}CO and ^{13}CO)

B6 (211-275 GHz)

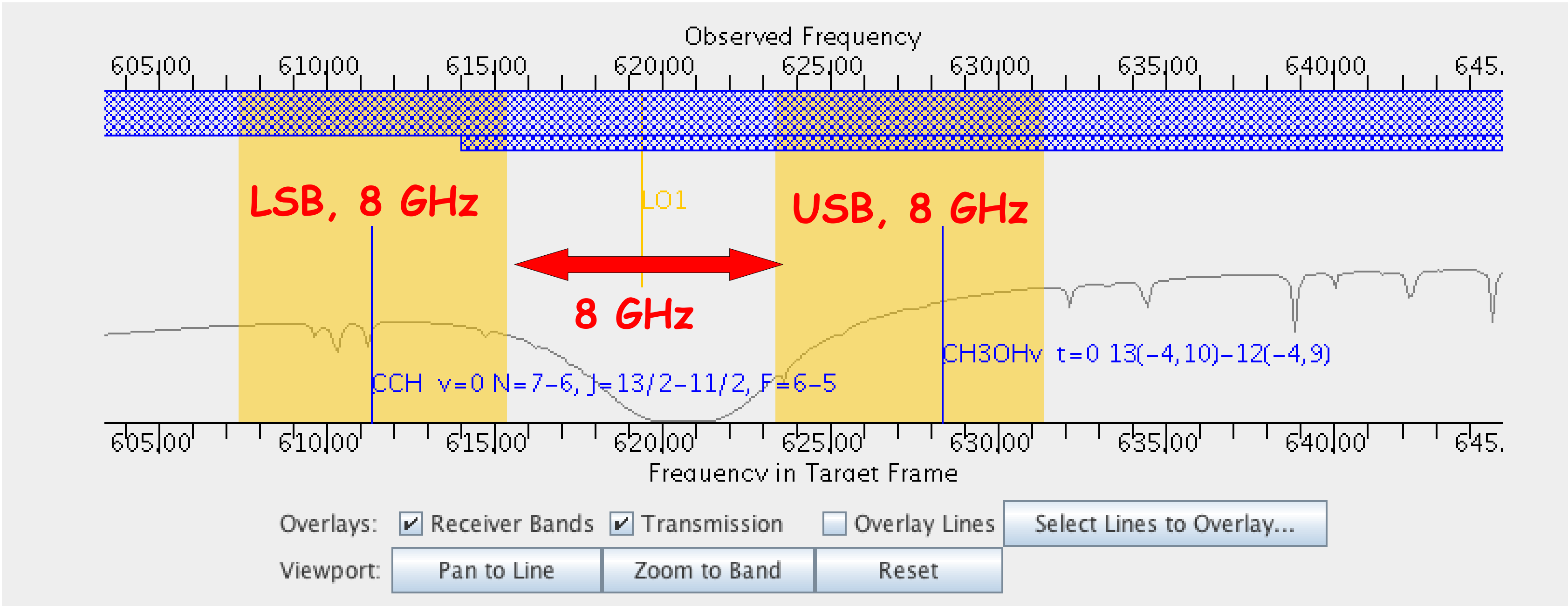


DSB receivers (B9-B10)

For ES only B9

- Sidebands are separated in the correlator
- Sidebands are 8 GHz wide and separated by 8 GHz

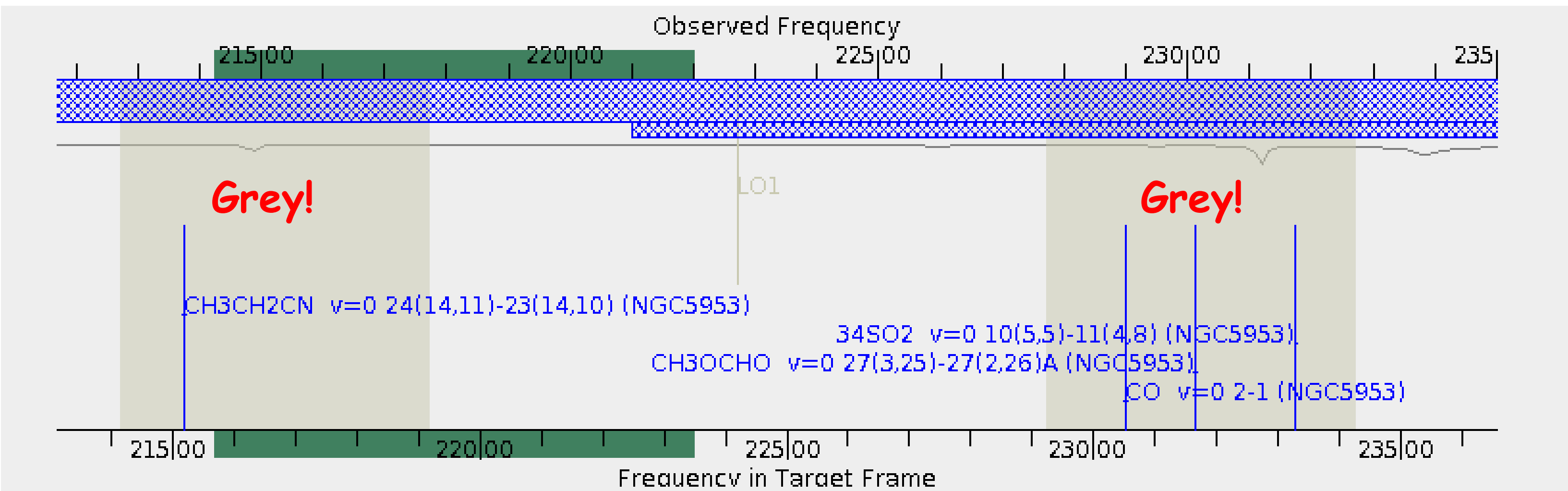
B9 (602-720 GHz)



Spectral window constraints for ES

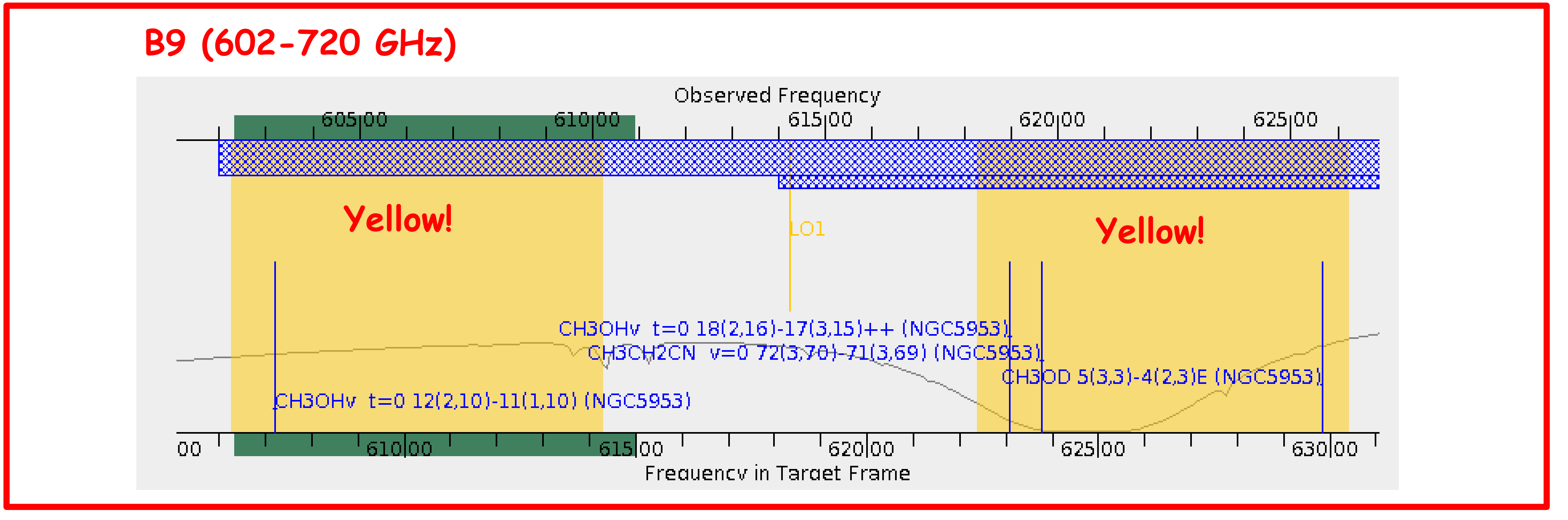
- All spectral windows use the same correlator mode: SAME BANDWIDTH, SAME RESOLUTION
- 2SB receivers (B3, B6, and B7)
    i. All (for a maximum of 4 spectral windows for this call) in USB or LSB
    ii. 2 in USB and 2 in LSB
    iii. A 3/1 split is **not possible**

B6 (211-275 GHz)



Spectral window constraints for ES

- DSB receivers (B9-B10): A 3/1 split is **possible**



Correlator Modes

Two kinds of operation

- Time Division Mode (**TDM**)
  i. Pseudo-continuum/wide spectral line
  ii. SPW always 2-GHz wide with 128-256 channels
- Frequency Division Mode (**FDM**)
  i. High-resolution spectral line
  ii. SPW can be 58.6-1875 MHz wide with up to 7680 channels

ES-Cycle 0 Correlator Modes in Dual Polarization

BANDWIDTH	CHANNELS	SP. RESOLUTION	
Pseudo-Continuum (2 GHz)	128 channels	15.6 MHz	TDM
1875 MHz	3840 channels x Pol	488 kHz	FDM
938 MHz	3840 channels x Pol	244 kHz	FDM
469 MHz	3840 channels x Pol	122 kHz	FDM
234 MHz	3840 channels x Pol	61 kHz	FDM
117 MHz	3840 channels x Pol	30.5 kHz	FDM
58.6 MHz	3840 channels x Pol	15 kHz	FDM

Line Observations

ES-Cycle 0 Correlator Modes in Dual Polarization

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For a maximum of 4 spectral windows

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For a maximum of 4 spectral windows

Line + Continuum Observations

- Time Division Mode (TDM)
  - i. Observe a wide spectral line with 2-GHz wide spectral window
  - ii. Other 3 spectral windows can be used for continuum

ES-Cycle 0 Correlator Modes in Dual Polarization

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Line + Continuum Observations

- Time Division Mode (**TDM**)

    i. Observe a wide spectral line with 2-GHz wide spectral window

    ii. Other 3 spectral windows can be used for continuum

- Frequency Division Mode (**FDM**)

    i. Highest spectral resolution for the line (narrow bandwidth)

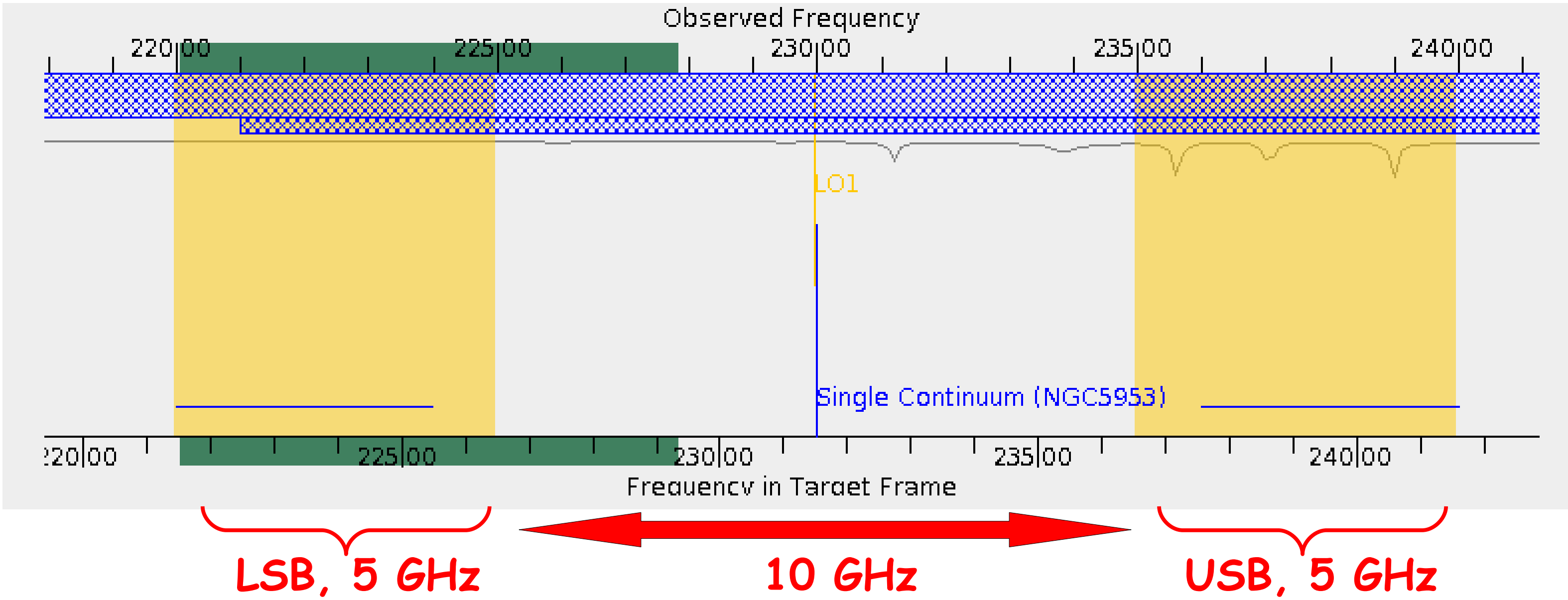
    ii. Remaining spectral windows will have same bandwidth (narrow for continuum)!

    iii. A solution might be to use separate Science Goals (one for line + one for continuum) ⟶ **MORE OBSERVING TIME**

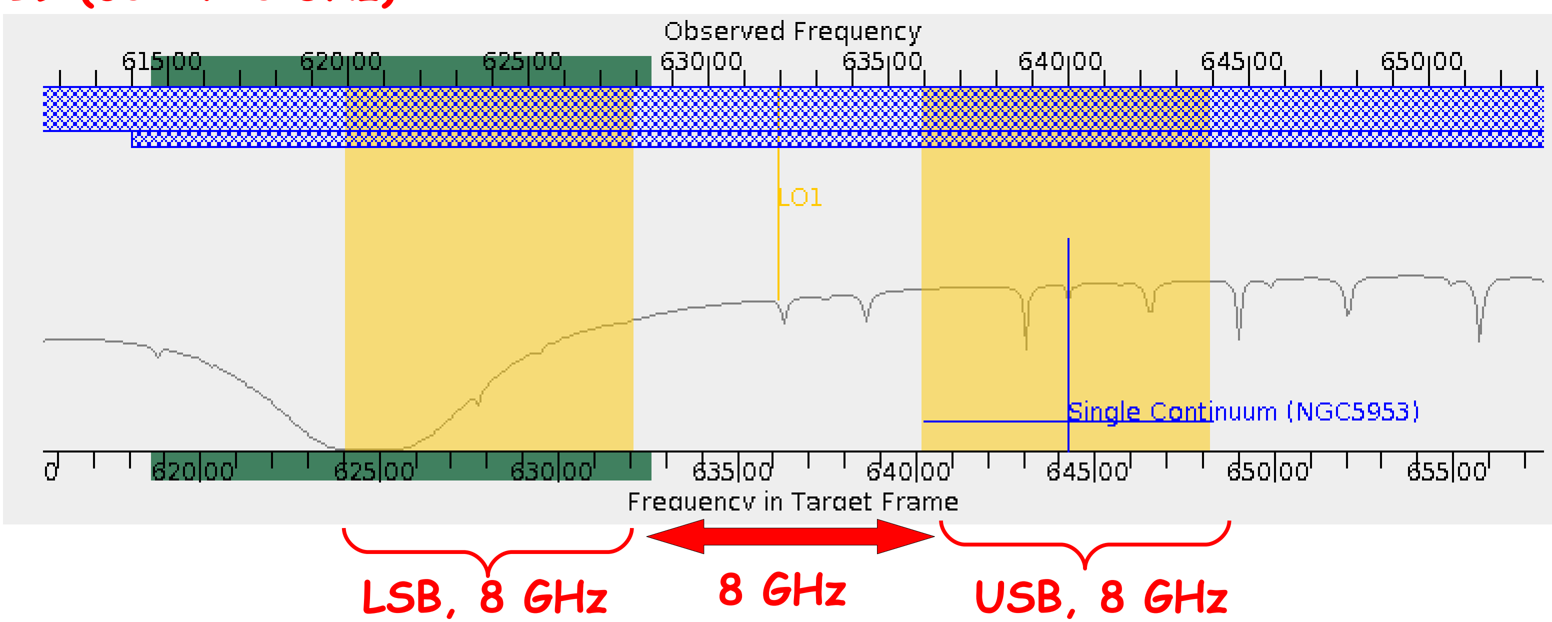
Single Continuum Observations

- Only define a single frequency

B6 (211-275 GHz)



B9 (602-720 GHz)



Phases of Proposal Submission

2 Phases:

- Phase I: Proposal Submission
- Phase II: Submission of Observing Program

The Observing Tool (OT) is used for both phases:

Phase I

- Fill in PI, co-PIs, etc ... (ALL ALREADY REGISTERED)
- Attach scientific/technical justification (single PDF)
- Define Science Goals
- Submit

Phase II

- If awarded time, generate Scheduling Blocks from Science Goals and submit

Phase I

Science Goal (SG)

- Scientific requirements of the observations
- A user must enter:
    i. Science Targets
    ii. Spectral line and/or continuum frequencies
    iii. Angular resolution, largest angular scale
    iv. Required sensitivity

Science Goal Constraints

- Field Setup: more than one source is allowed
    i. Widely separated sources in different SGs
    ii. Multiple targets cannot have a rectangular definition
- Spectral Setup: only one is allowed
    i. One Band
    ii. One set (up to 4) of simultaneously detectable lines
- Control Parameters (-->Sensitivity Calculator): only one is allowed (for the first line)

You will often need to define multiple Science Goals!

You may have to re-order your lines!

Scheduling Block (SB)

- A self-contained definition of an observation
- It contains:
  1. Source information (science targets + calibrators)
  2. Spectral Setup
  3. Observing Parameters
- A user will not normally interact with an SB!

What you don't ask for

- Time on source

    i. OT reports an estimated time based on likely weather: *observations will proceed until sensitivity is reached*

    ii. Additional time can be requested *(e.g., (u,v) coverage at Cycle 0 is poor, you must justify it in the proposal!)*

    iii. Several SGs with time ranges

- Calibration sources

    i. The observatory will provide all necessary calibration: *Choose "system-defined" calibration*

    ii. Own calibrators can be requested: *you must justify it in the proposal!*

OT

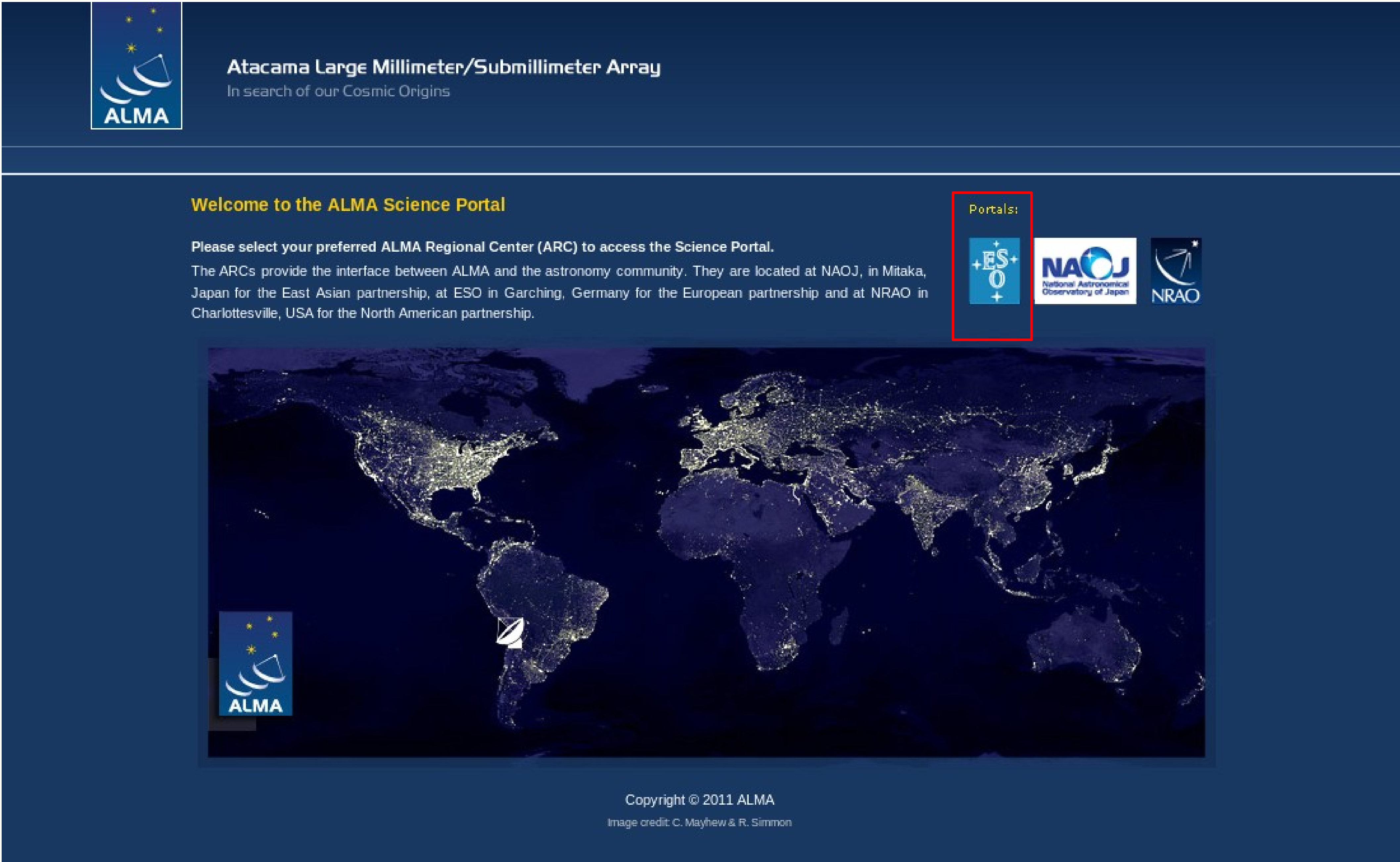
- The OT is a Java application
    i. Java 6 must be installed on your computer!

- Download and run locally
    i. Web Start (recommended) and Tarball versions

- Internet connection required intermittently
    i. PI/co-PIs information from user database
    ii. Source catalogues and images servers
    iii. Spectral line catalogues
    iv. Submission

ALMA SCIENCE PORTAL ----> http://almascience.org

The interaction between science users and ALMA is done through the ARCs.
The ALMA Science Portal allows this interaction.



ALMA SCIENCE PORTAL @ ESO

Atacama Large Millimeter/Submillimeter Array

In search of our Cosmic Origins

Login & Registration

Search Site

Portals: ESO NRAO NAOJ

Log in Register Reset password

- Home
- About ALMA
- ALMA Science
- Call for Proposals
- ALMA Data
- Documents & Tools

User Services at ARCs

- Helpdesk
- ALMA@ESO
- ALMA@NRAO
- ALMA@NAOJ

OT

Info You are now logged out.

Welcome to the ALMA Science Portal at ESO

Overview

The Atacama Large Millimeter/submillimeter Array (ALMA) is a major new facility for world astronomy. When completed in 2013, ALMA will consist of a giant array of 12-m antennas, with baselines up to 16 km, and an additional compact array of 7-m and 12-m antennas to greatly enhance ALMA's ability to image extended targets. ALMA is outfitted with state-of-the-art receivers that cover atmospheric windows from 84–950 GHz (3mm – 300 micron). Construction of ALMA started in 2003 and will be completed in 2013. Science observations will start in 2011 with 16 antennas and four receiver bands. The ALMA project is an international collaboration between Europe, East Asia and North America in cooperation with the Republic of Chile. More details can be found via the ***About ALMA*** link in the left menu.

This is the website for **The ALMA Science Portal**, served from one of the **ALMA Regional Centers (ARCs)** of the ALMA partner organizations: ESO, NRAO or NAOJ. You may switch between the different instances of the portal through the links to the appropriate ALMA partner at the top banner. Through this portal you can find details about the technical capabilities of ALMA, how to propose for observing time, and how to access ALMA data. It includes links to all official ALMA documents and tools, including those for preparing and submitting proposals and processing ALMA data. In order to access some of the tools, users must register with the project and login to the portal via the links at the top banner.

General News

ALMA Cycle 0 Call for Proposals is now open
Mar 30, 2011

More...

Local News

The Nordic ARC invites applications for an indefinite Staff Astronomer position.
Feb 16, 2011

ALMA Community Days 6-7 April 2011: Towards Early Science
Dec 17, 2010

ESO Takes Delivery of State-of-the-art Receiver
Dec 15, 2010

Dutch ALMA Workshop, Leiden, Netherlands, 20-21 April 2011
Dec 10, 2010

ESO hands over the ALMA Santiago Central Office headquarters to the Joint ALMA Observatory
Nov 05, 2010

The OT

Atacama Large Millimeter/Submillimeter Array

In search of our Cosmic Origins

Search Site

Portals: ESO NRAO NAOJ

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- Home
- About ALMA
- ALMA Science
- Call for Proposals
  - Capabilities
  - Road Map
  - Proposers Guide
  - Technical Guide
  - **Observing Tool**
    - Webstart Download Page
    - Tarball Download Page
    - OT Video Tutorials
    - Troubleshooting
  - Sensitivity Calculator
  - Notice of Intent

Home ▸ Call for Proposals ▸ Observing Tool

Observing Tool

The ALMA Observing Tool (OT) is a Java application used for the preparation and submission of ALMA Phase I (observing proposal) and Phase II (telescope runfiles for accepted proposals) materials. The current *Cycle 0* release of the OT is configured for the Early Science Capabilities of ALMA as described in the Cycle 0 Call For Proposals. Note that in order to submit proposals you will have to register with the ALMA Science Portal beforehand.

Download & Installation

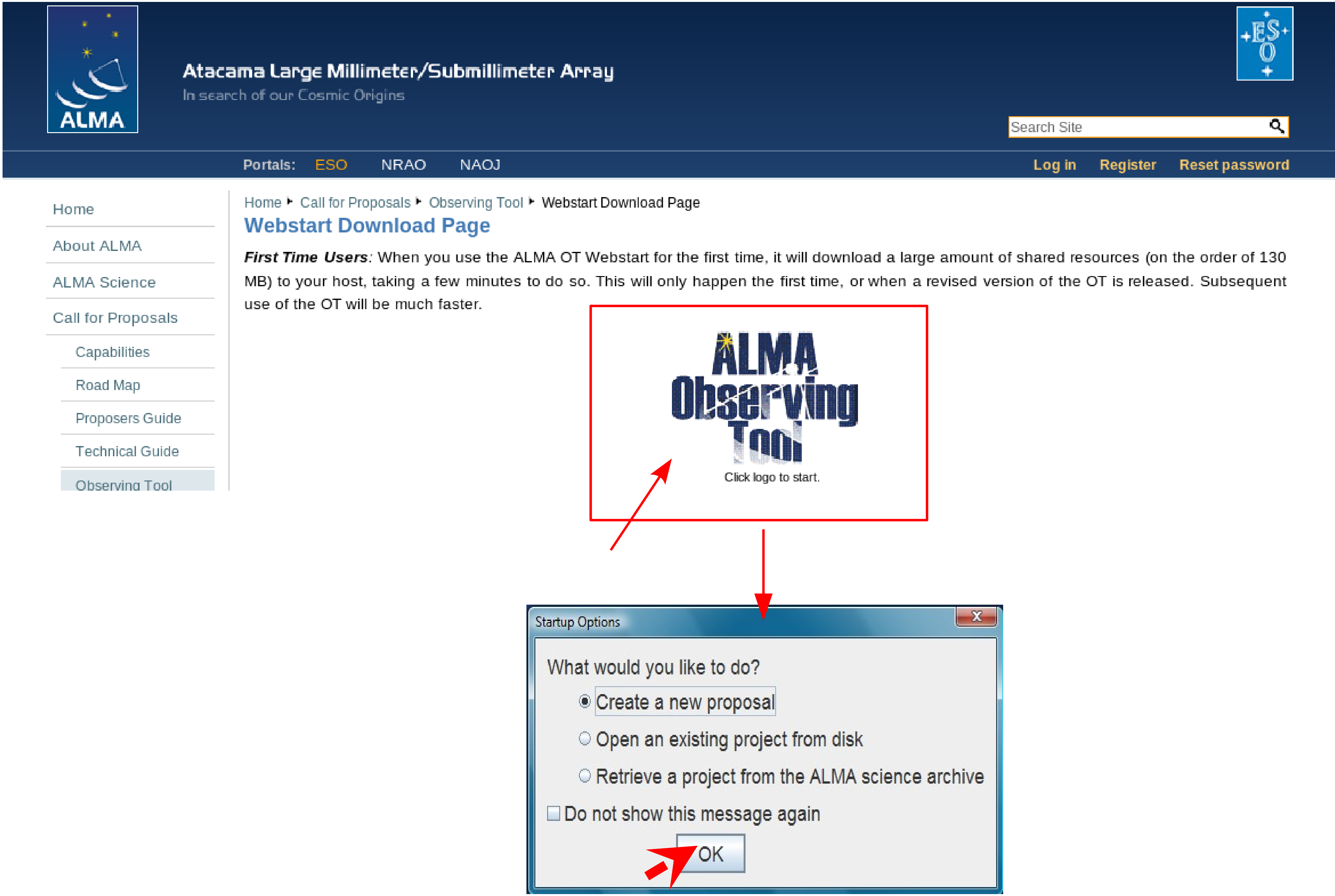
The OT will run on most common operating systems, as long as you have Java 6 installed (see the troubleshooting page if you are experiencing Java problems). The ALMA OT is available in two flavours: WebStart and tarball.

The **WebStart** application has the advantage that the OT is automatically downloaded and installed on your computer. However, your Java Webstart needs to be working. Note that the WebStart does not work with the Open JDK versions of Java such as the "Iced Tea" flavour common on many modern Linux installations. If this is the case, the tarball installation of the OT should be used.

The **tarball** must be installed manually, however it has the advantage that it is more robust than the WebStart application and will work with most versions of Java 6. For Linux users we also provide a download of the OT complete with a recommended version of the Java run time environment. Please use this if you have any problems running the OT tarball install with your default Java.

WebStart Tarball

The OT



Atacama Large Millimeter/Submillimeter Array
In search of our Cosmic Origins
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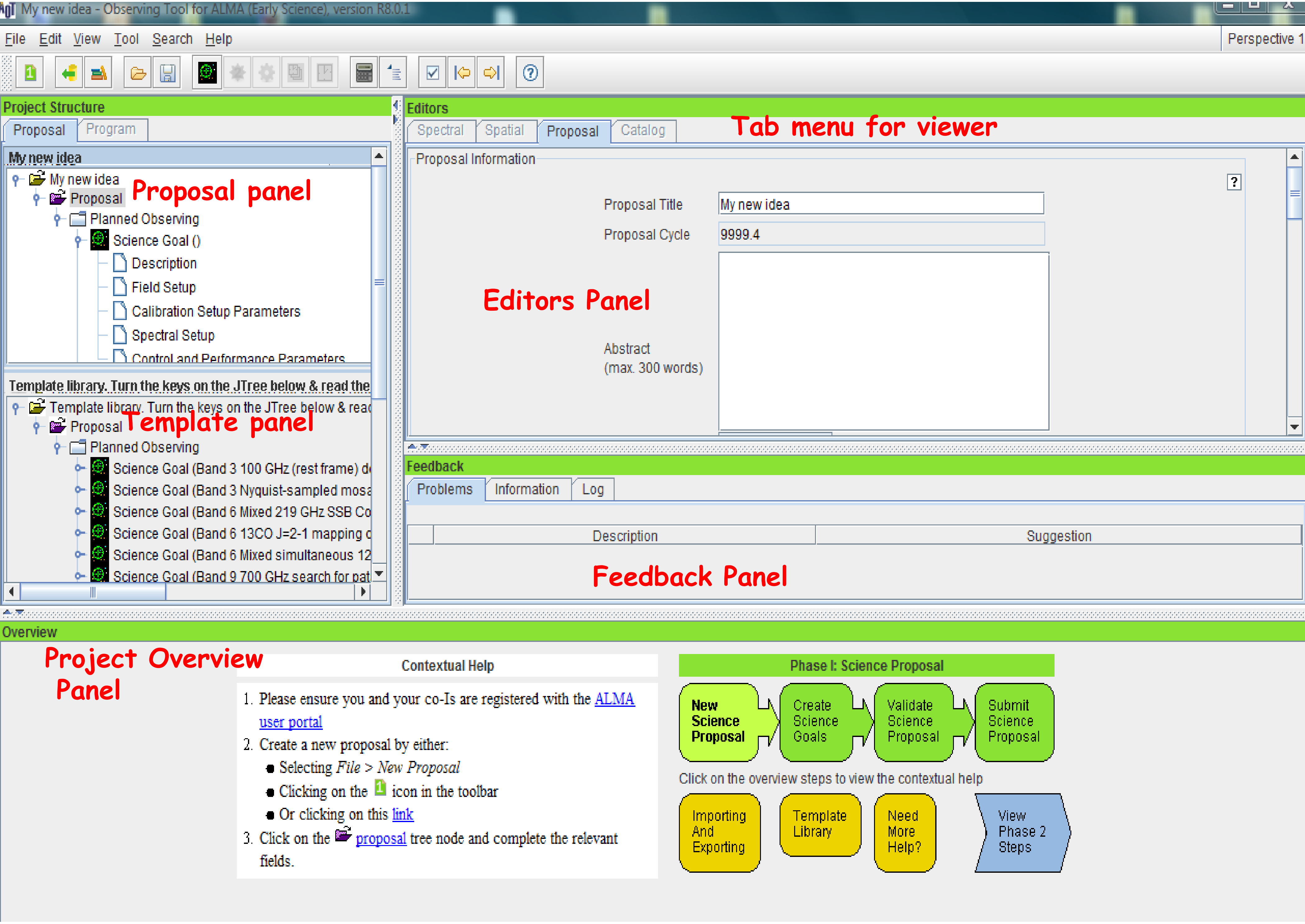
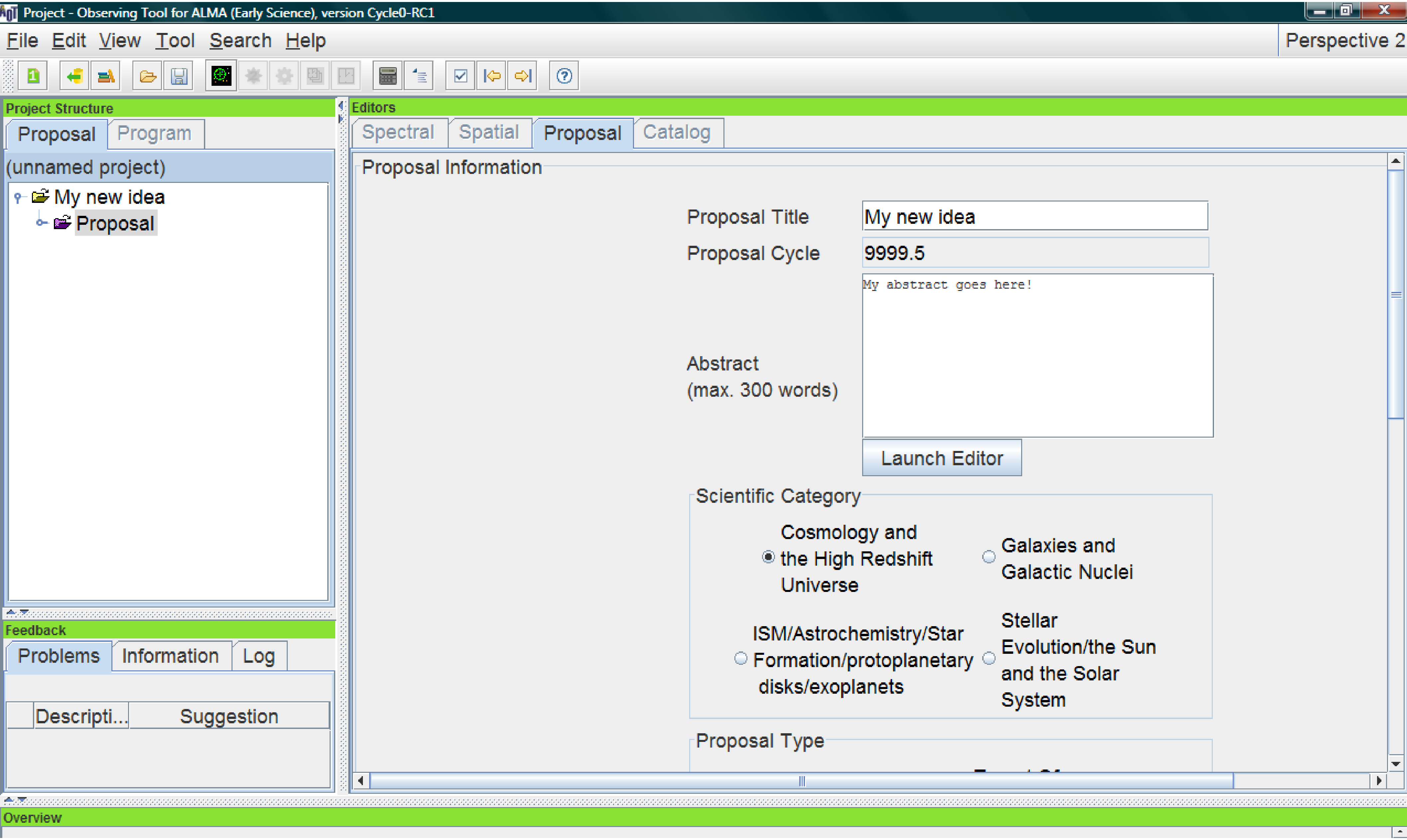
ALMA Science
Call for Proposals
Capabilities
Road Map
Proposers Guide
Technical Guide
Observing Tool
Home ▸ Call for Proposals ▸ Observing Tool ▸ Webstart Download Page
Webstart Download Page
First Time Users: When you use the ALMA OT Webstart for the first time, it will download a large amount of shared resources (on the order of 130 MB) to your host, taking a few minutes to do so. This will only happen the first time, or when a revised version of the OT is released. Subsequent use of the OT will be much faster.
ALMA Observing Tool
Click logo to start.
Startup Options
What would you like to do?
Create a new proposal
Open an existing project from disk
Retrieve a project from the ALMA science archive
Do not show this message again
OK

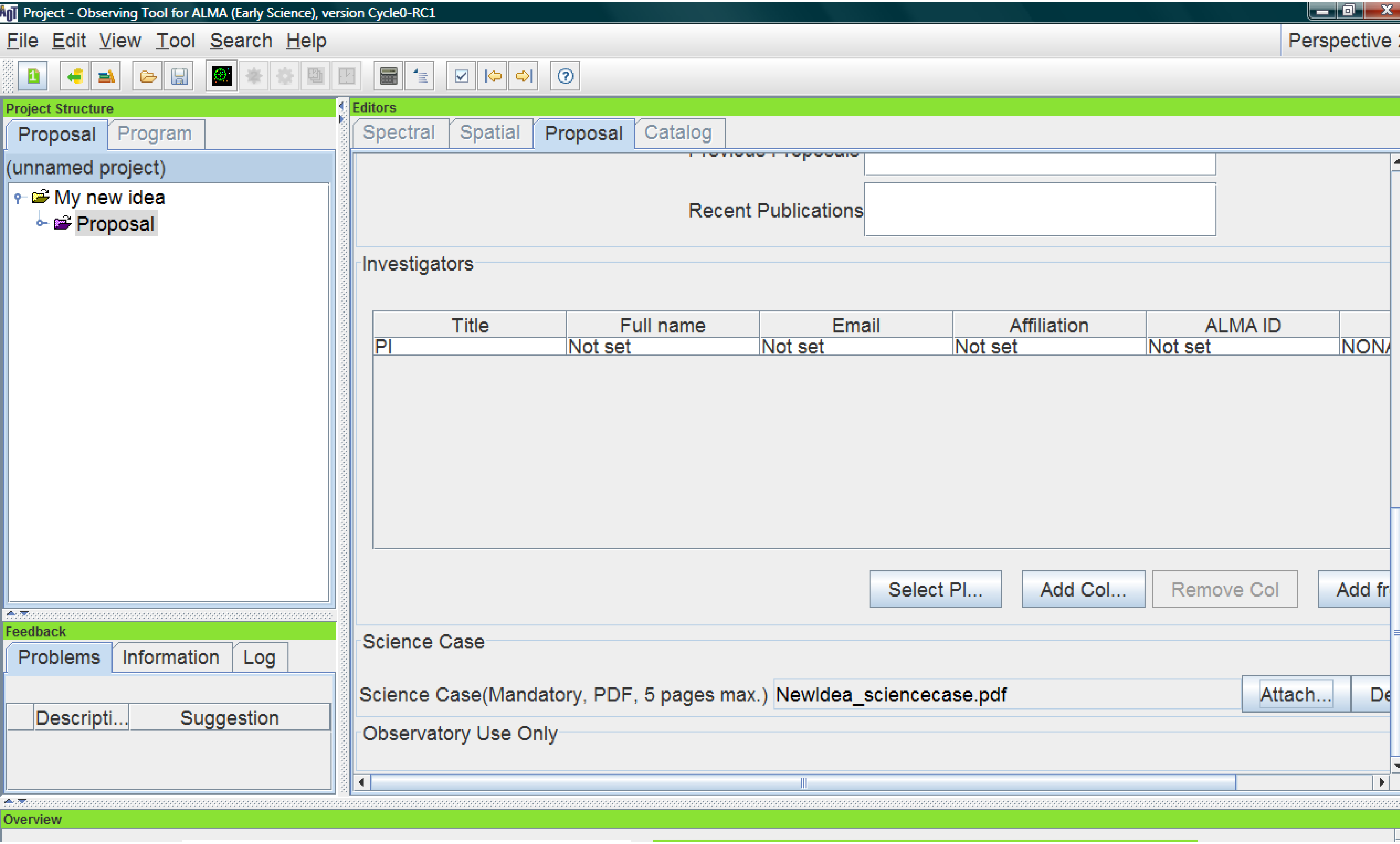
OT structure



The project properties

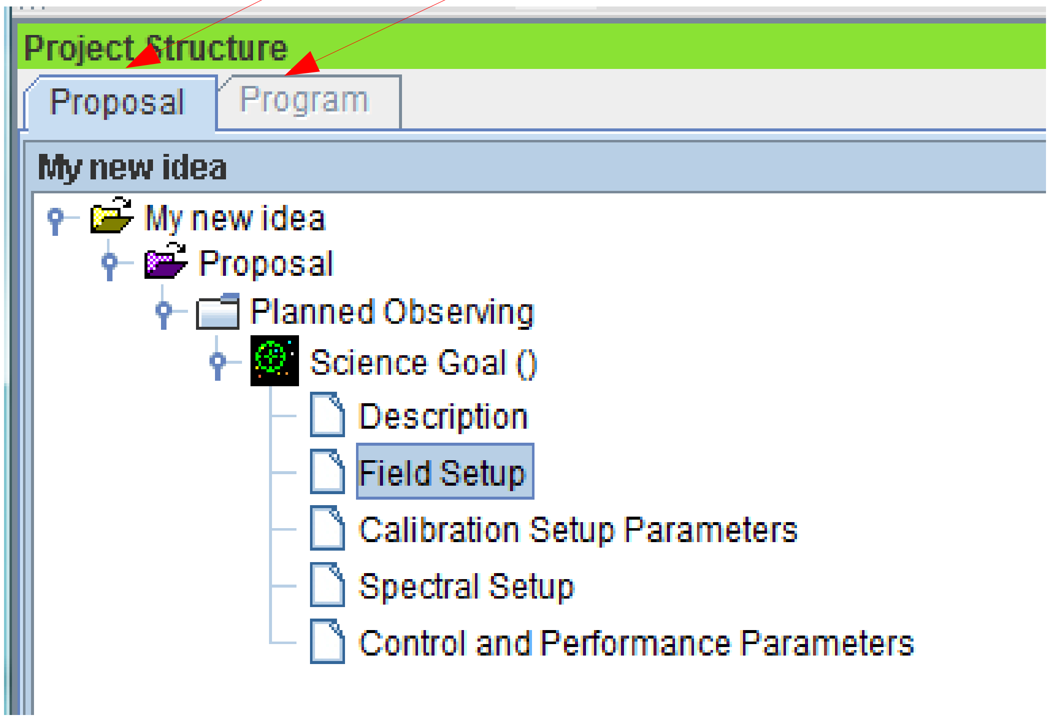


The project properties



Project navigation and Science Goal

- Navigate through project using the Project Tree
- Two tabs
  - i. Proposal (Phase I)
  - ii. Program (Phase II)

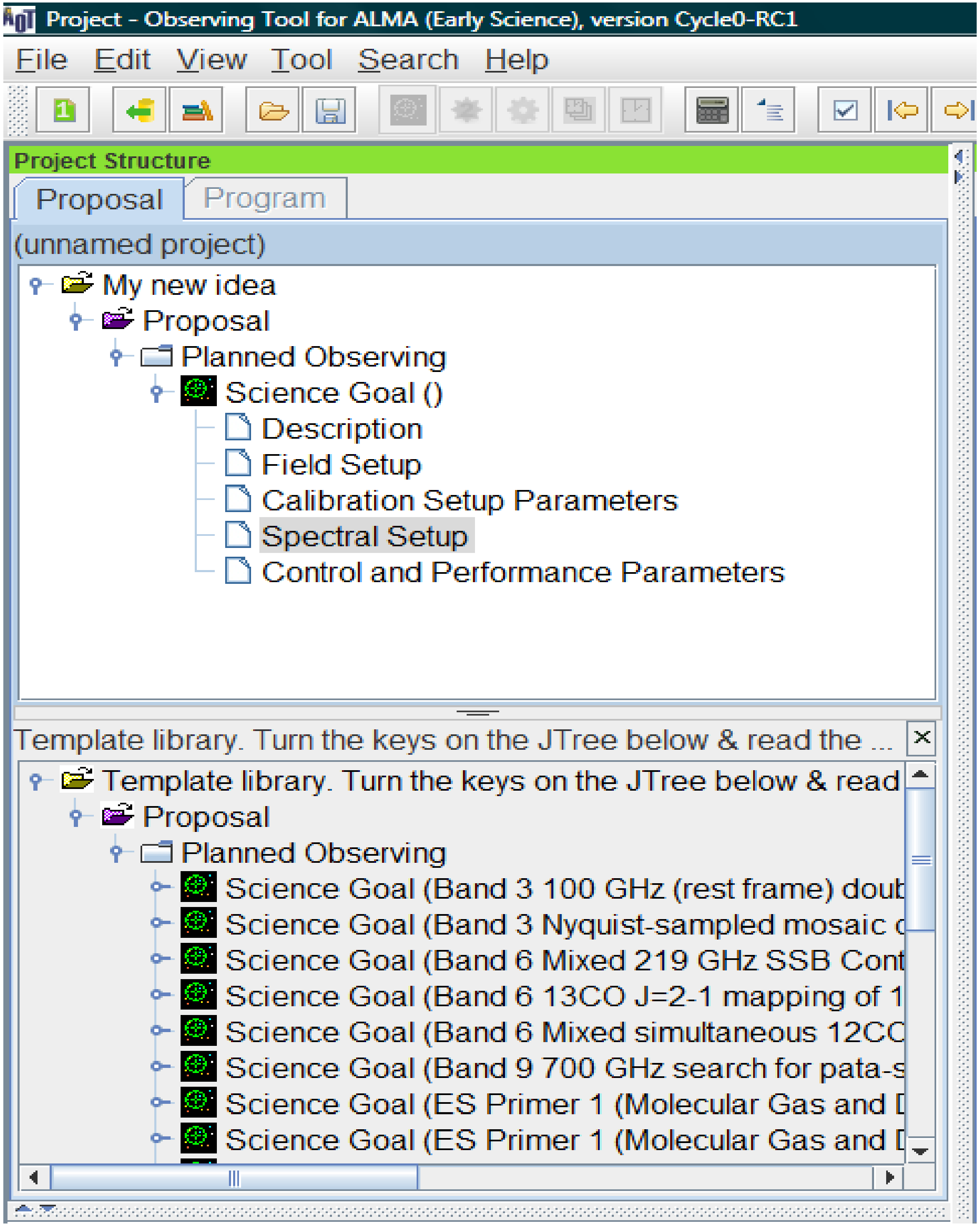


The OT divides the observing info of a project into **SGs**

SG is a container of

- i. An optional description of the goal
- ii. the Field Setup to define the observing targets
- iii. The Calibration Setup
- iv. The Spectral Setup to define the frequency range and correlator configuration
- v. The Control and Performance parameters to define the sensitivity and resolution goals

The Science Goal: Template Library

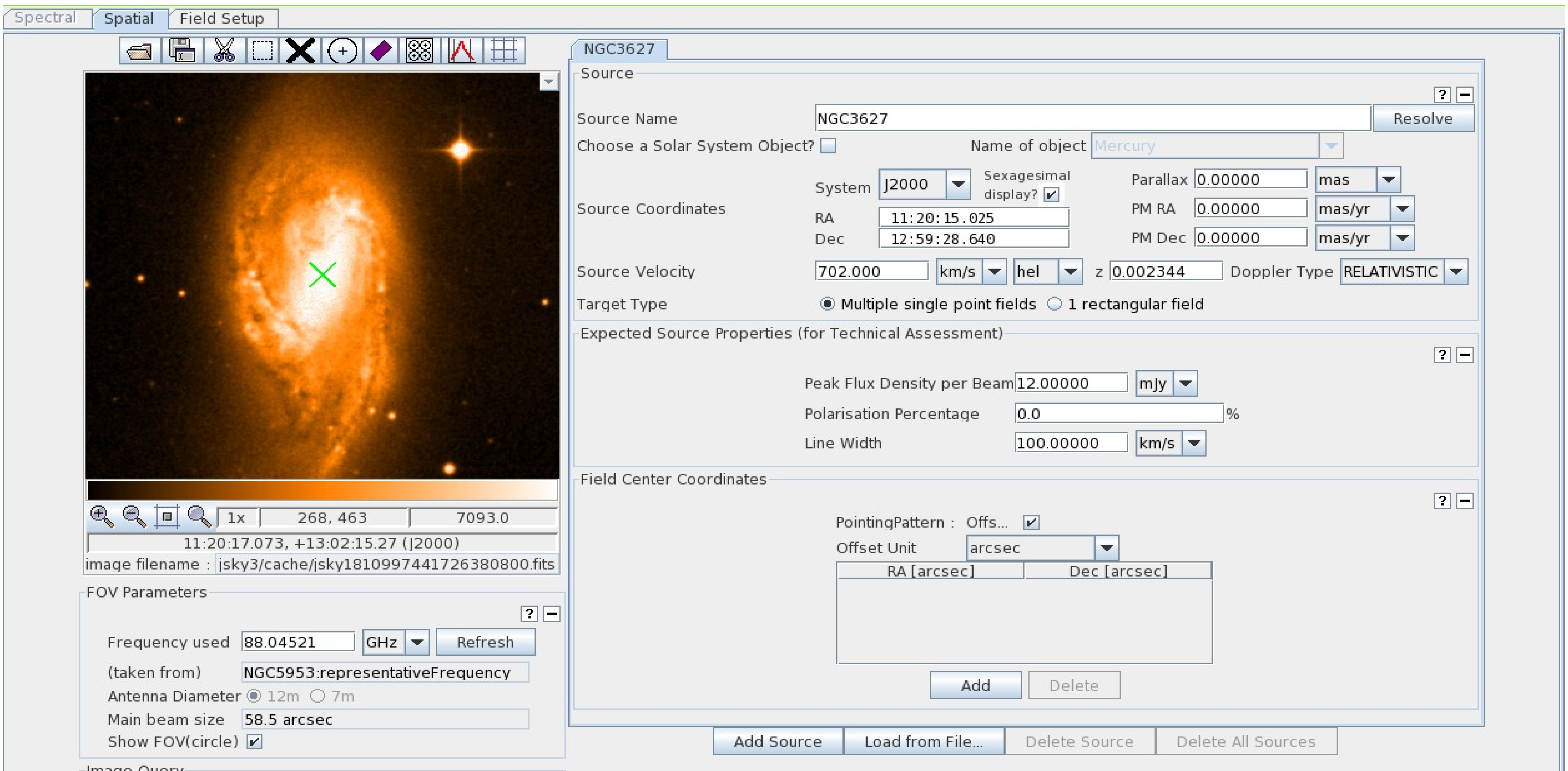


A selection of hot science topics for science goal templates is on-board the OT

Possibility to drag and copy the full science goal!!!

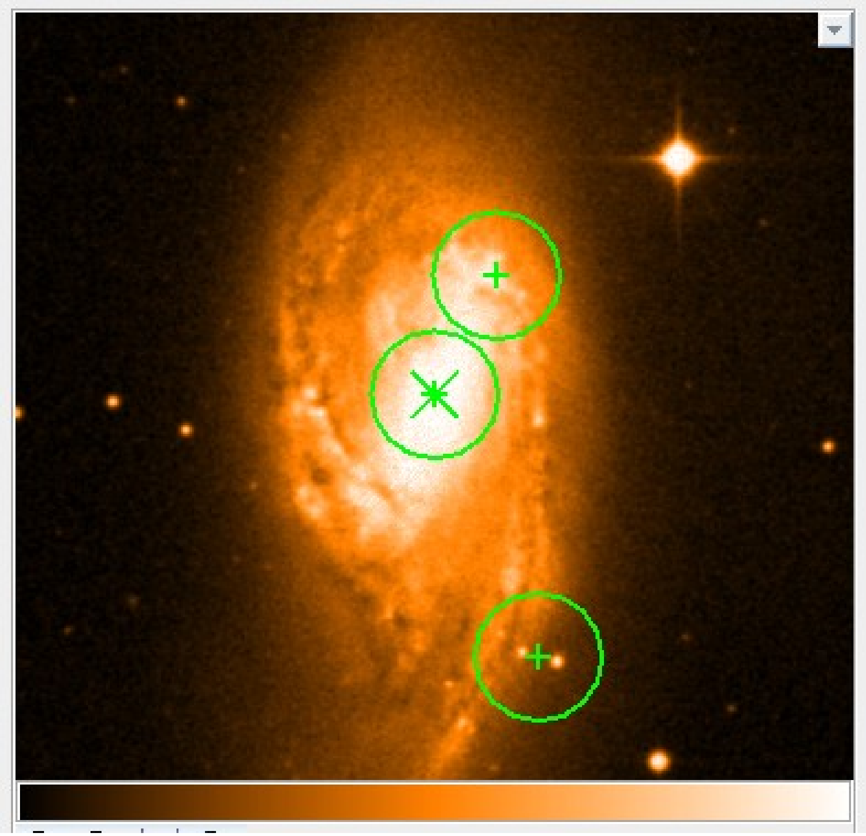
The Spatial Visual Editor

- Downloads and displays an image of the sky
  i. Image server (DSS, 2MASS, NVSS, FIRST, ...)
  ii. Local images files (FITS)
- Other required information
  i. Coordinate and velocity information
  ii. Source properties (peak flux density, polarization, line width)

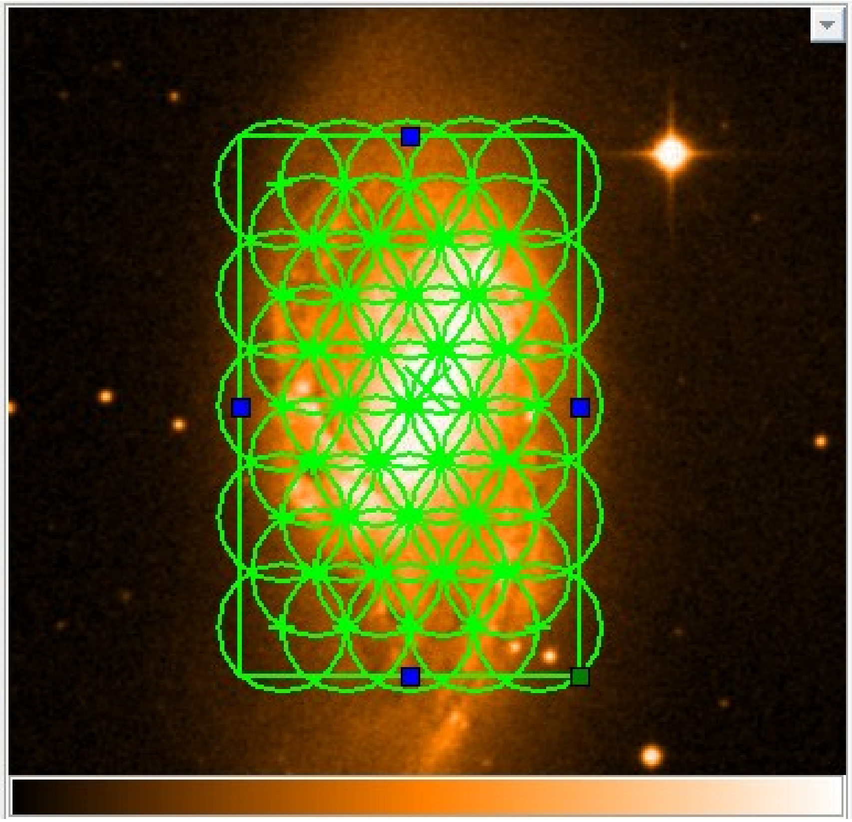


Mosaicking

Single field pointings

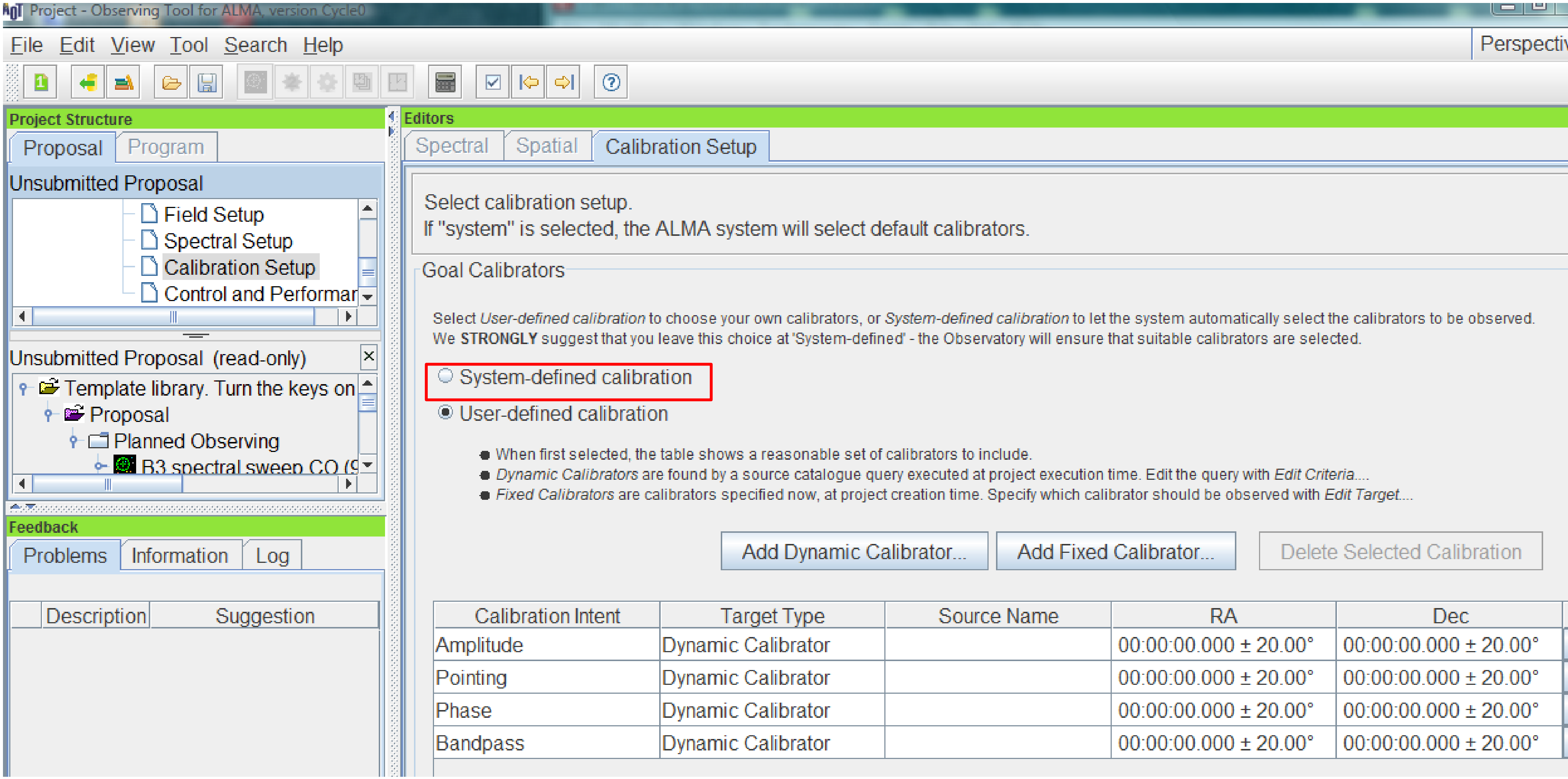


Mosaic (up to 50 pointings for Cycle 0)

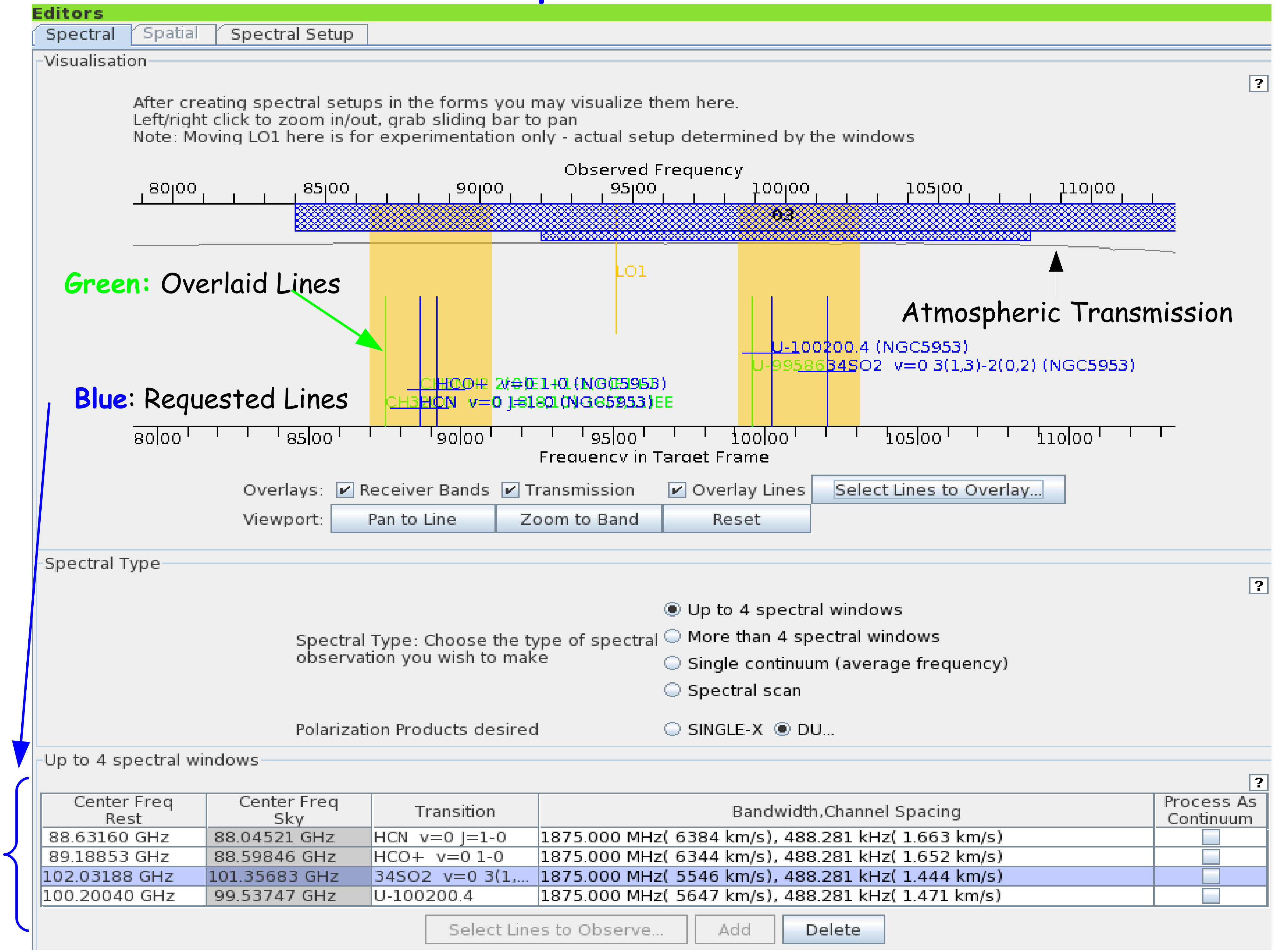


The Calibration Setup

The "System-defined calibration" is strongly suggested

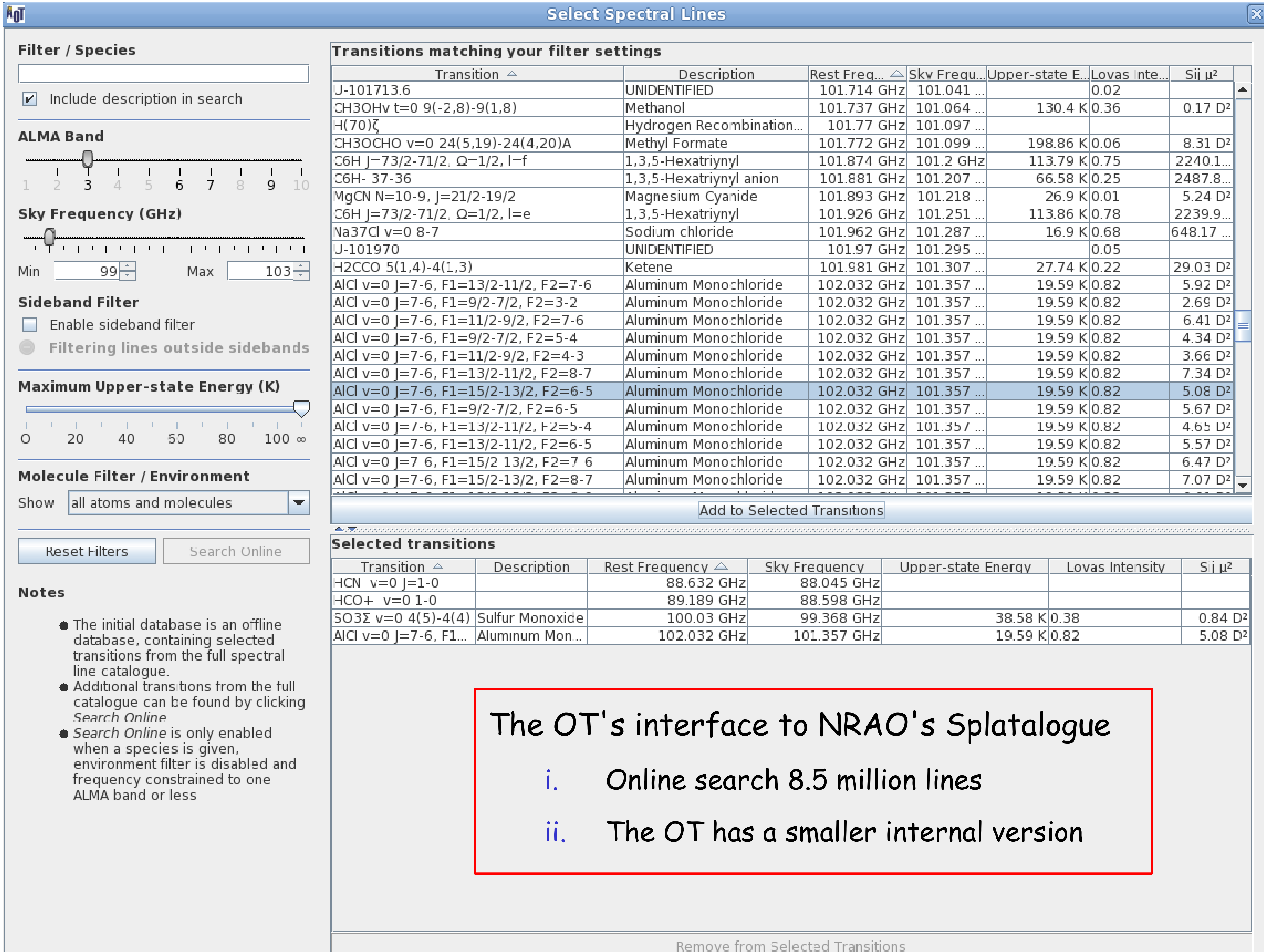


The Spectral Visual Editor



Center Freq Rest	Center Freq Sky	Transition	Bandwidth,Channel Spacing	Process As Continuum
88.63160 GHz	88.04521 GHz	HCN v=0 J=1-0	1875.000 MHz(6384 km/s), 488.281 kHz(1.663 km/s)	
89.18853 GHz	88.59846 GHz	HCO+ v=0 1-0	1875.000 MHz(6344 km/s), 488.281 kHz(1.652 km/s)	
102.03188 GHz	101.35683 GHz	34SO2 v=0 3(1,...	1875.000 MHz(5546 km/s), 488.281 kHz(1.444 km/s)	
100.20040 GHz	99.53747 GHz	U-100200.4	1875.000 MHz(5647 km/s), 488.281 kHz(1.471 km/s)	

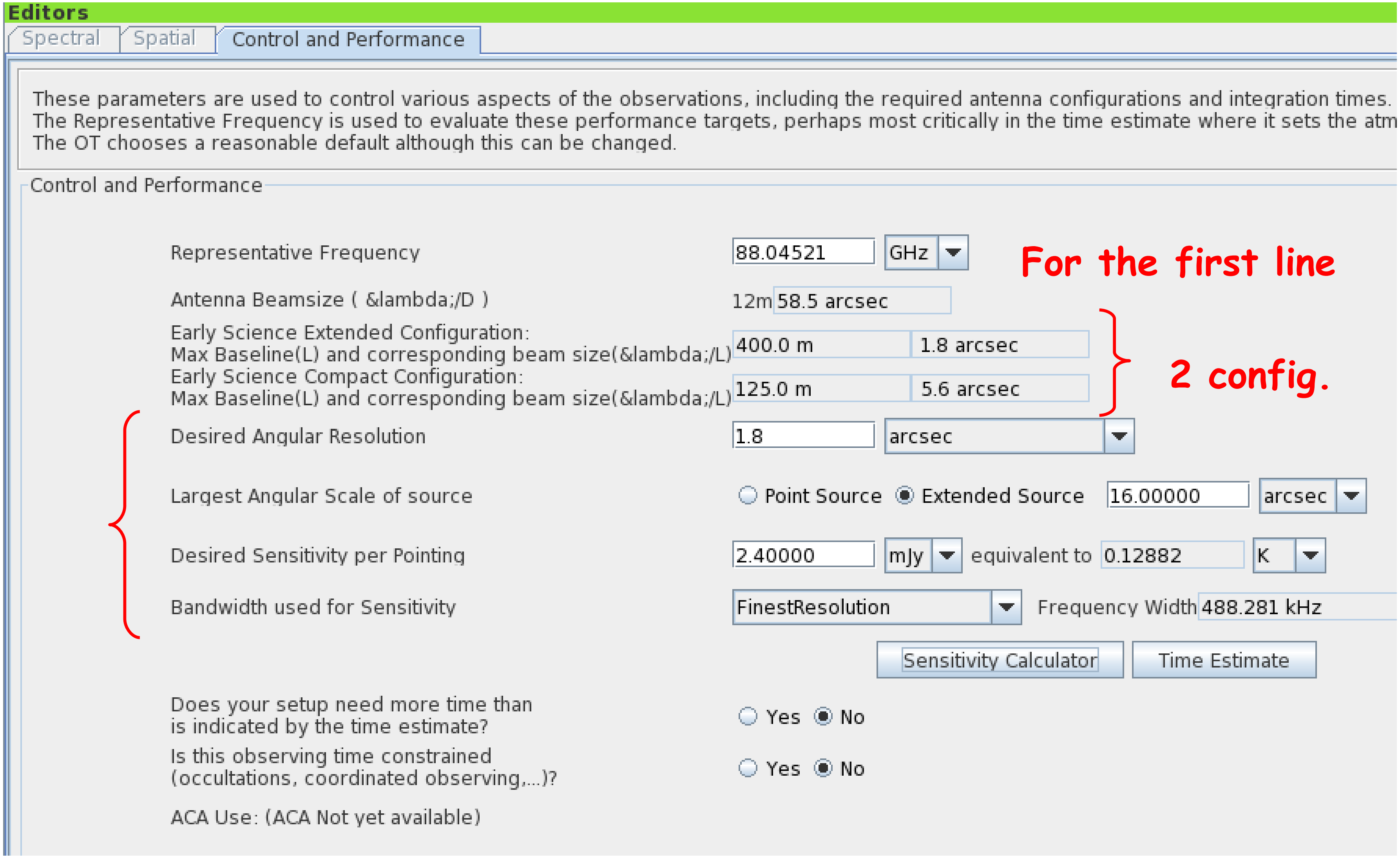
The Spectral Line Picker



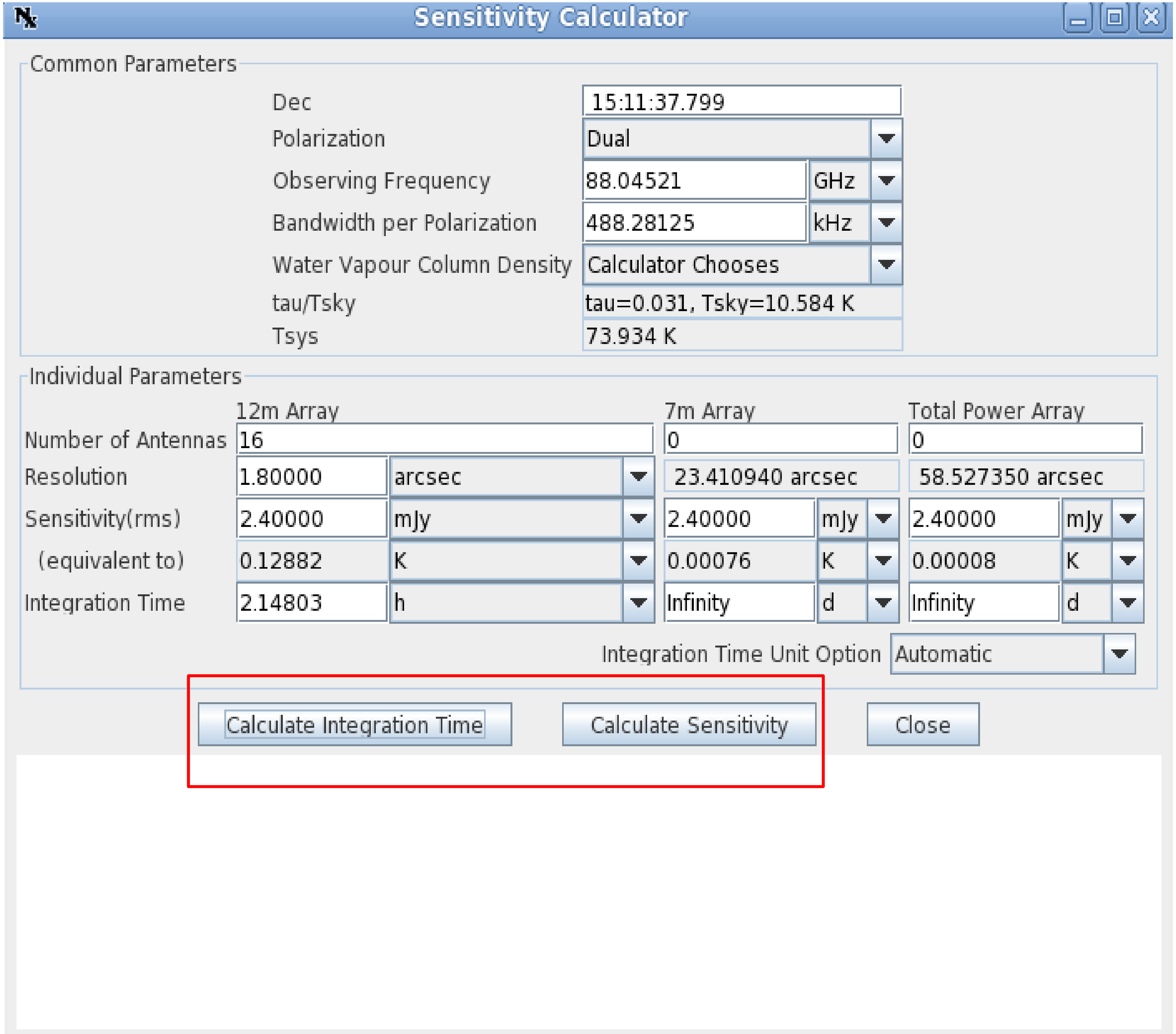
The OT's interface to NRAO's Splatalogue

i. Online search 8.5 million lines
ii. The OT has a smaller internal version

Control and Performance



Sensitivity Calculator



Estimated Time

Information

Estimated time

Requested Sensitivity	2.4000 mJy
Bandwidth used for Sensitivity	488.281 kHz
Required Time on Source per Pointing	2.15 h
Number of Antenna Configurations	1
Total Number of Pointings	1
Total on Source	2.15 h
Total Estimated Time (inc. Calibration)	2.50 h

Estimated Times

Calibration Breakdown	
Bandpass (inc. AtmosphericCal)	28.26 s x 1 = 28.26 s
Pointing	18.00 s x 9 = 2.70 min
Amplitude (inc. AtmosphericCal)	26.04 s x 1 = 26.04 s
Phase	8.00 s x 26 = 3.47 min
Atmospheric	26.00 s x 33 = 14.30 min

Calibration Times

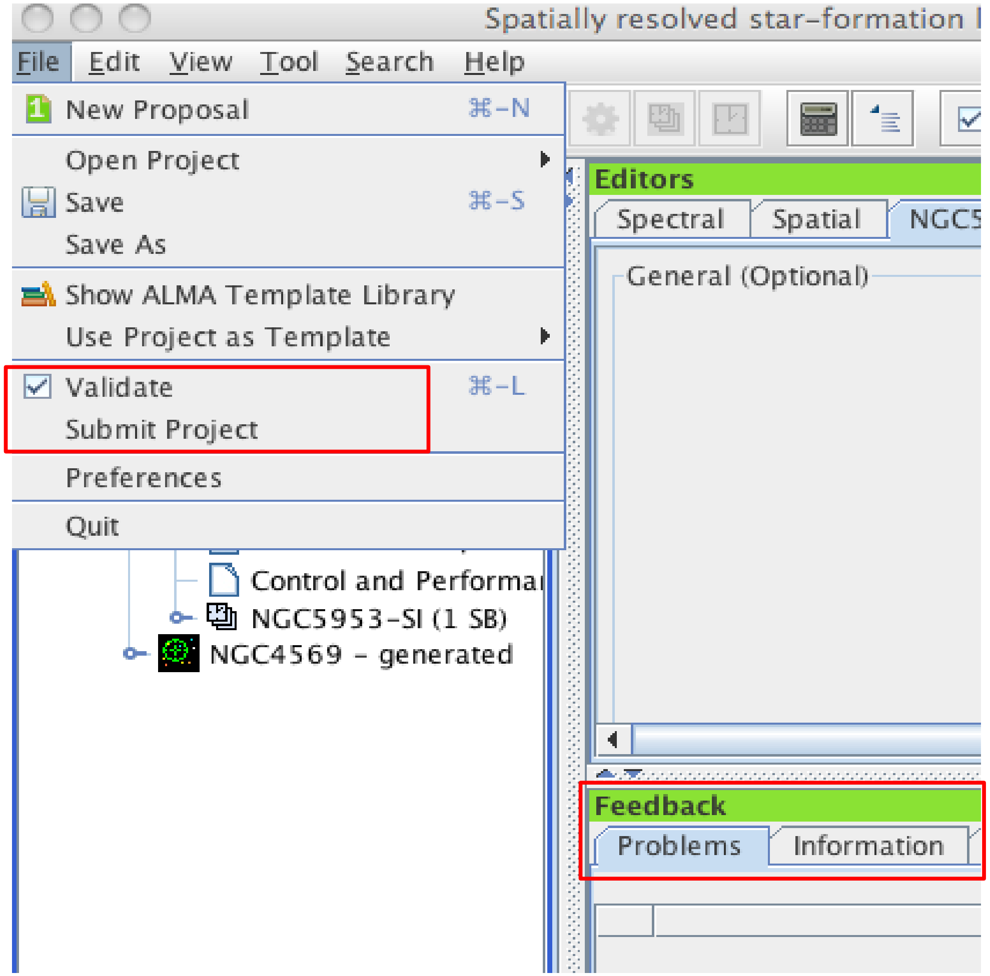
Achievable Sensitivity	
HCN v=0 J=1-0 with 12m Array	2.4000 mJy
HCO+ v=0 1-0 with 12m Array	2.3978 mJy
34SO2 v=0 3(1,3)-2(0,2) with 12m Array	2.4481 mJy
U-100200.4 with 12m Array	2.4227 mJy

OK

Sensitivities obtained with the time needed for the first line

Proposal Submission and Resubmission

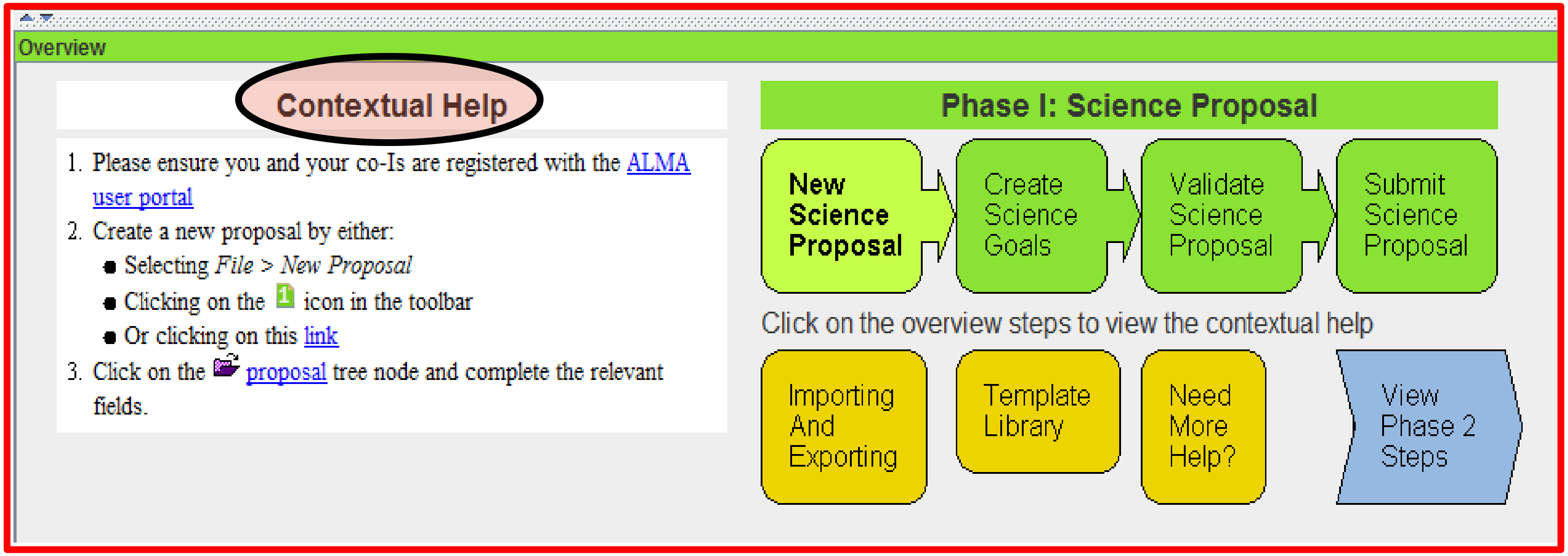
- When ready, validate your proposal
  1. OT checks that all necessary information is present
  2. Errors appear in the Feedback Panel
  3. A project cannot be submitted without validation
- For your records
  1. E-mail will acknowledge submission
  2. Printable summary of proposal is produced
- OT asks you to save to disk:
  Project code is assigned
- Resubmission is possible up to the deadline

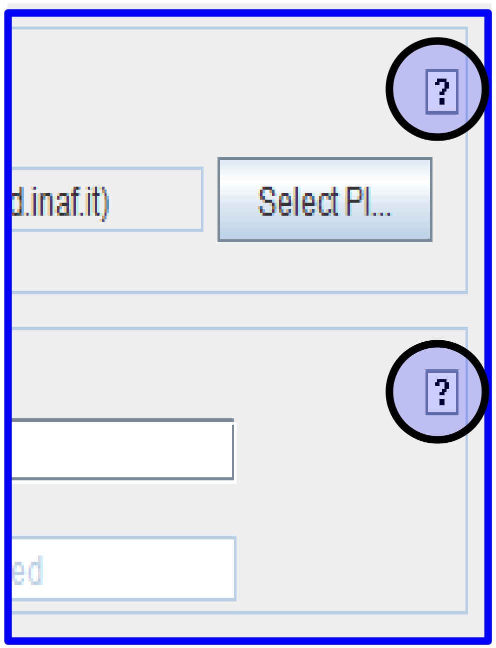


Phase II Observing Program

- Proposal Review process via email and successful investigators will be invited to submit the detailed observing plan
- The OT is used to prepare individual Scheduling Blocks (SBs)
- The SBs are generated from the Science Goal automatically
- Each SB will last 30-40 min

Documentation & Help





OT User Manual

Video Tutorial

For any questions on OT, ALMA data reduction, ... please contact the ALMA Helpdesk @

www.almascience.eso.org

P. Andreani's Lecture for details on the submission of a ticket to the ALMA Helpdesk

ITALIAN ARC
Web: http://www.alma.inaf.it
Email: help-desk@ira.inaf.it

Enjoy your ALMA proposal!