Cycle 1 ALMA Proposal Preparation: The Observing Tool (OT)

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In collaboration with ARC's Team

Tutorials for ALMA – Cycle 1
Bologna, June 6th, 2012

Outline

- Glossary
- Early Science Cycle-1: Constraints
- Phases of Proposal Submission (Phase I and Phase II)
- ALMA SCIENCE PORTAL
- ALMA Observing Tool Structure

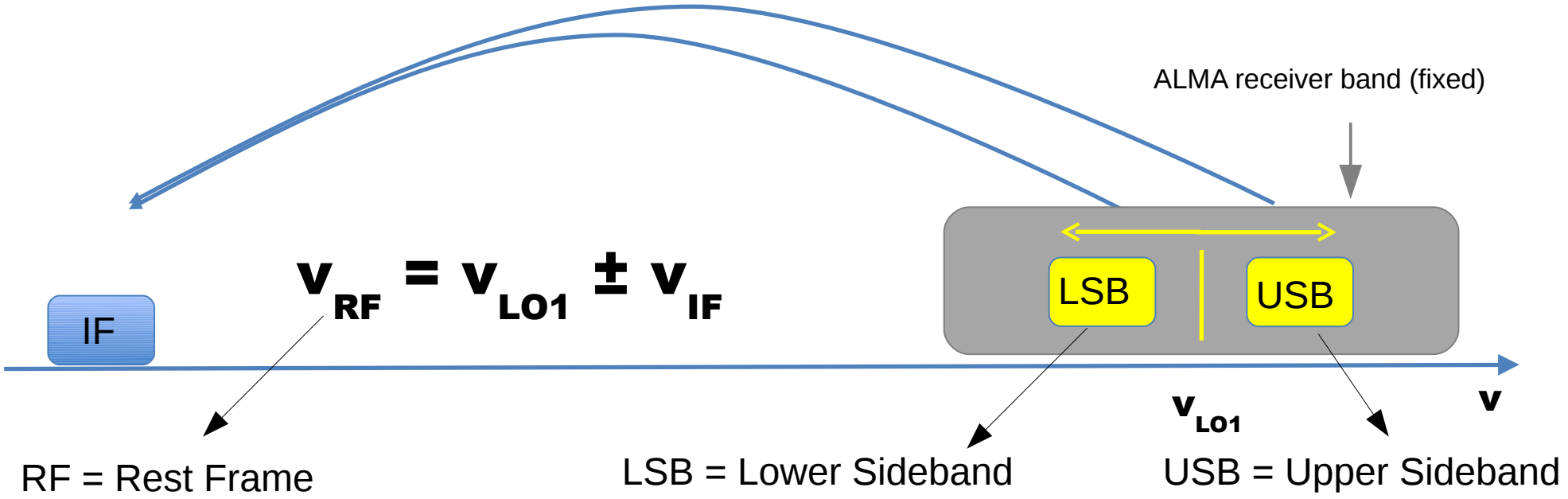
Sidebands

- 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

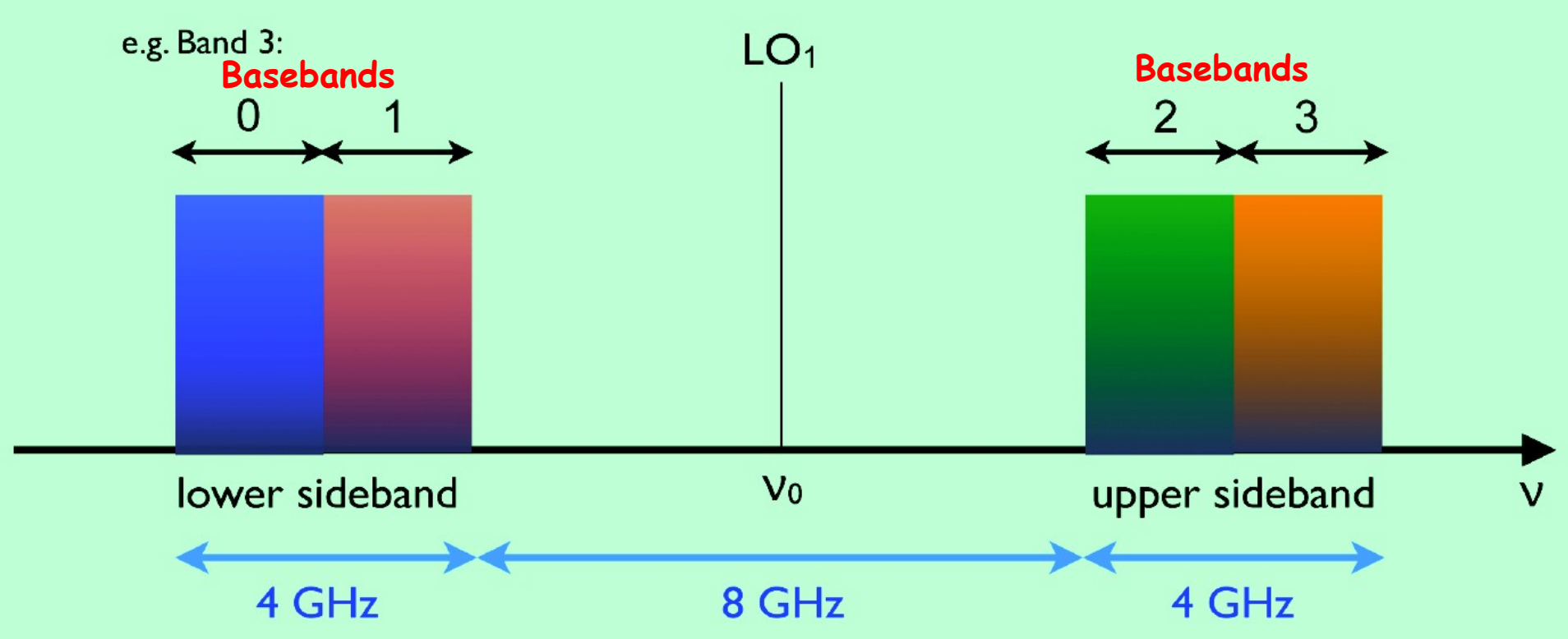
  i. Dual Sidebands (2SB: B3, B6, and B7)

  ii. Double Sideband (DSB: B9)

  iii. Both are present at ***Early Science (ES) Cycle 1*** (also at ***ES Cycle 0***)

Basebands

- A 2 GHz wide portion of the available signal which is digitized at the antenna
- The 4 x 2 GHz-wide 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

- ***ES Cycle 1:*** up to four Spectral Windows, one per Baseband, and each Spectral Window can have a different Bandwidth and Spectral Resolution: ***Independent Basebands***

ES Cycle 0 allowed one Spectral Window per Baseband <u>with identical Bandwidth and Spectral Resolution</u>

ALMA ES
Correlator Modes

Two kinds of operation

- Time Division Mode (**TDM**)

    i. Modest Frequency Resolution
    ii. Continuum/wide spectral line observations
    iii. SPW always 2-GHz wide with 128-256 channels

- Frequency Division Mode (**FDM**)

    i. High Frequency Resolution
    ii. High-resolution spectral line observations
    iii. SPW can be 58.6-1875 MHz wide with up to 7680 channels

ALMA ES *Cycle 1*
Correlator Modes

Bandwidth (MHz)	Dual Polarization		Single Polarization		Correlator mode
	Ch Spacing* (MHz)	Number of channels	Ch Spacing* (MHz)	Number of channels	
2000*	15.6	128	7.8125	256	TDM
58.6	0.0153	3840	0.00763	7680	FDM
117	0.0305	3840	0.0153	7680	FDM
234	0.061	3840	0.0305	7680	FDM
469	0.122	3840	0.061	7680	FDM
938	0.244	3840	0.122	7680	FDM
1875	0.488	3840	0.244	7680	FDM

* Spectral Resolution is 2 x the Channel Spacing

* The bandwidth is limited to 1875 MHz

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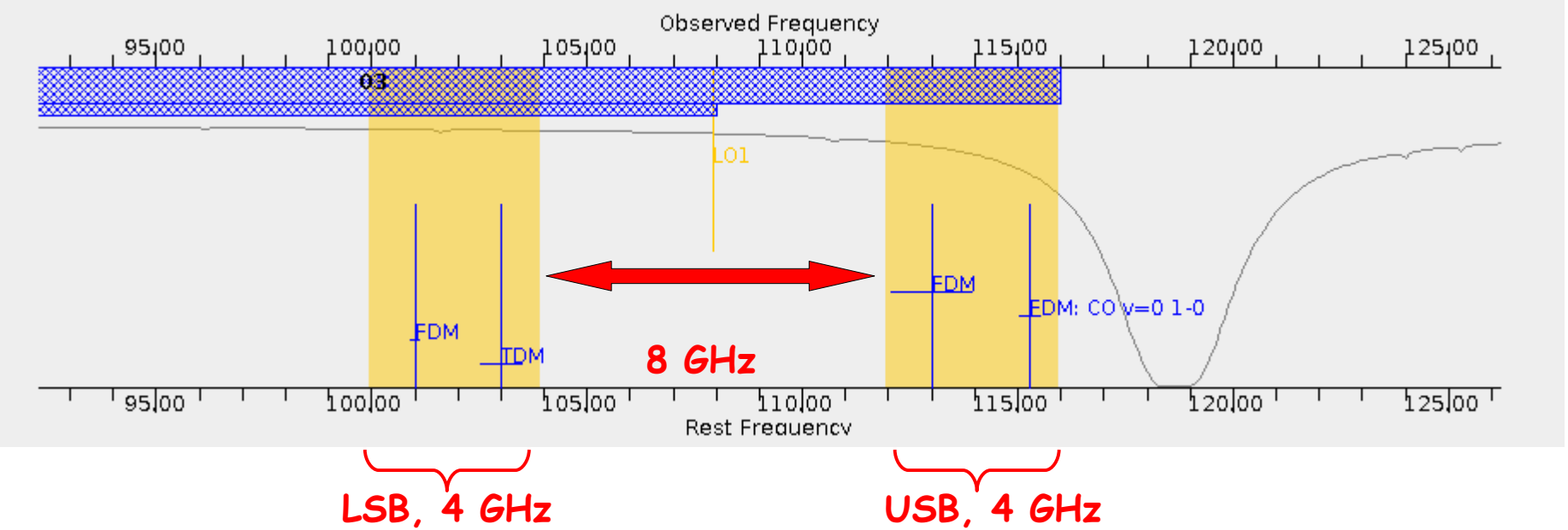
2SB receivers (B3, B6, B7)

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

B3 (84-116 GHz)

4 SPWs



B7 (275-373 GHz), same properties

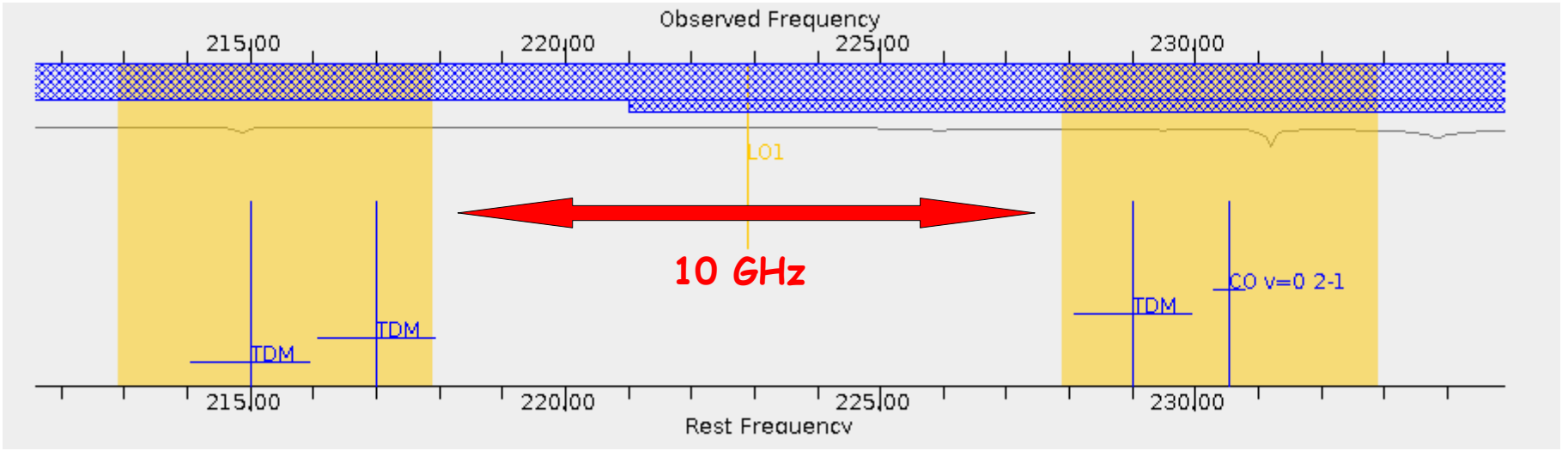
Observations of spectral lines within about 0.2 GHz of a Band edge are not possible at present.

2SB receiver (B6)

- But in Band 6 sidebands are 5 GHz wide and separated by 10 GHz

B6 (211-275 GHz)

4 SPWs: 1 FDM + 3 TDM



LSB, 5 GHz

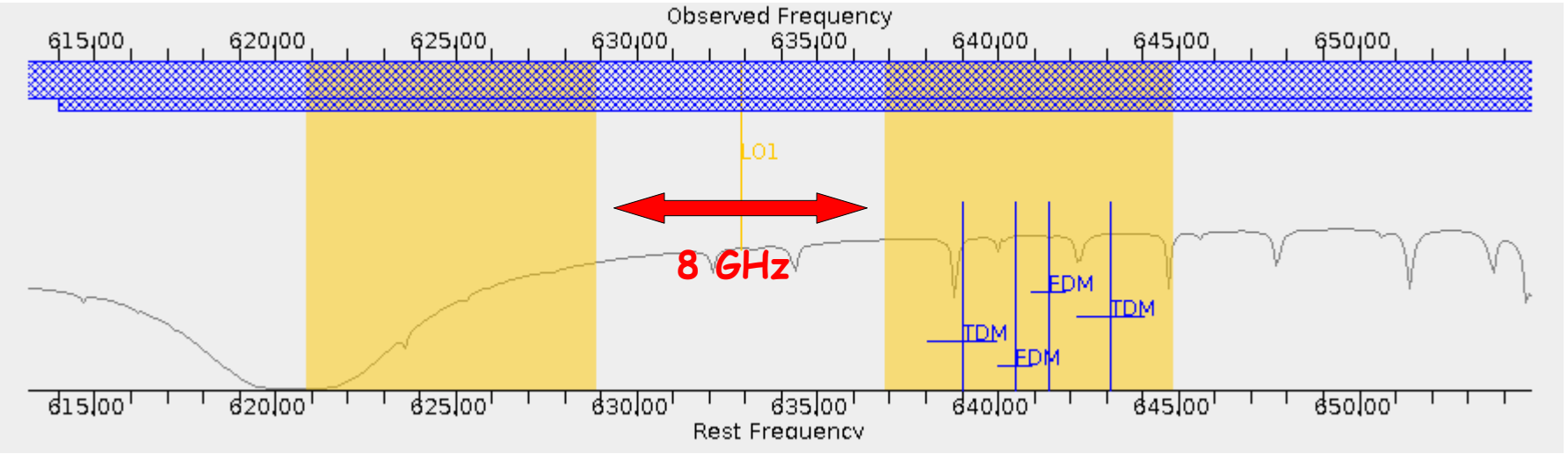
USB, 5 GHz

DSB receivers (B9)

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

B9 (602-720 GHz)

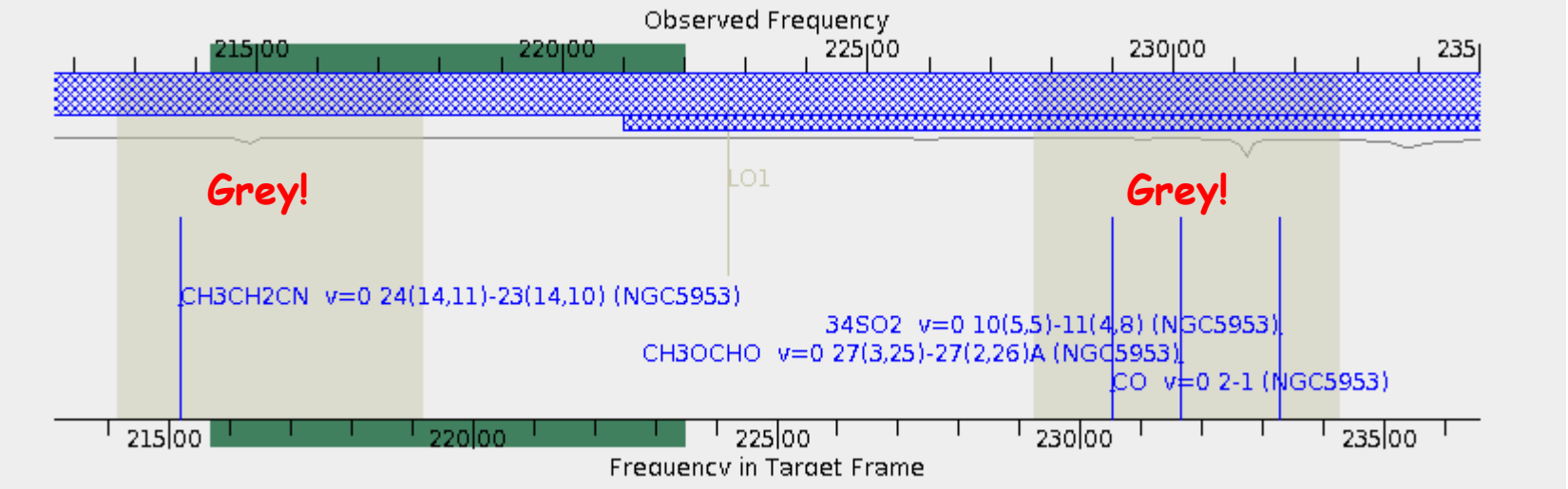
4 SPWs: 2 FDM + 2 TDM in the same Sideband



Spectral Window constraints for *Cycle 1*

- 2SB receivers (B3, B6, and B7)
  - i. All (for a maximum of 4 Spectral Windows) in USB or LSB
  - ii. 2 in USB and 2 in LSB
  - iii. A 3/1 split is **not possible**

B6 (211-275 GHz)

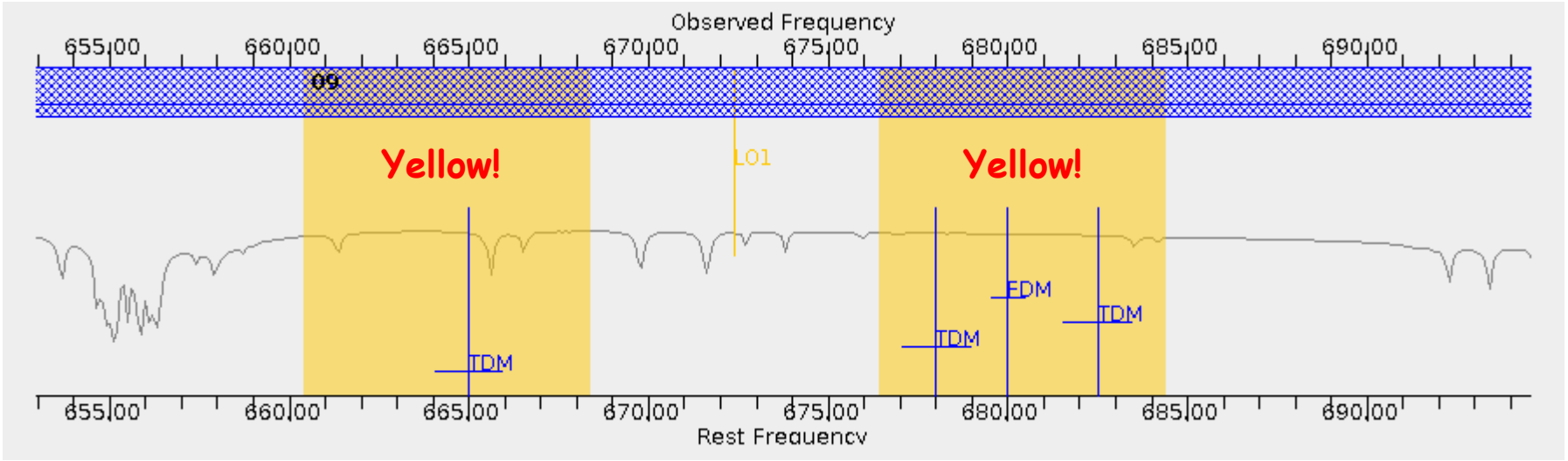


SPWs can overlap in frequency.

Spectral Window constraints for *Cycle 1*

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

B9 (602-720 GHz)

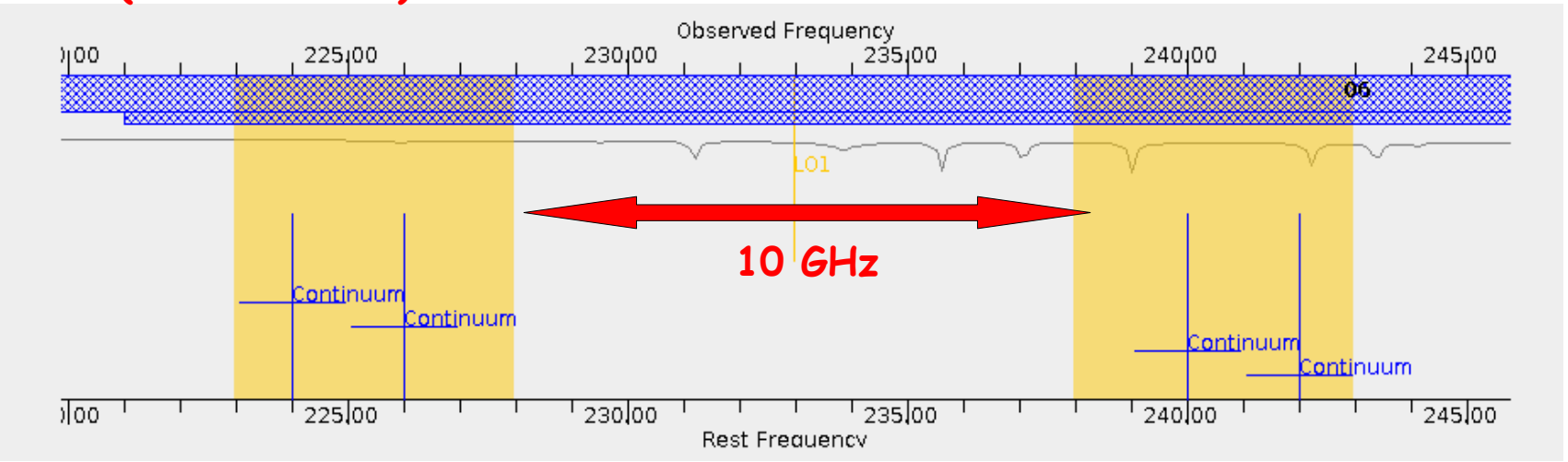


SPWs can overlap in frequency.

Single Continuum Observations

- It covers the maximum possible bandwidth with the lowest possible spectral resolution
- Only define a single frequency

B6 (211-275 GHz)



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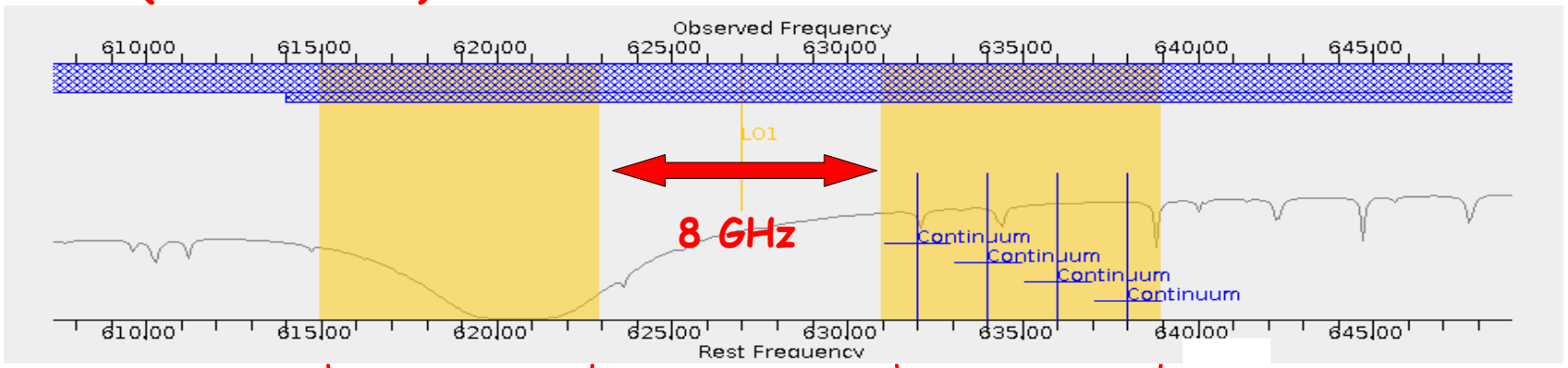


Phases of Proposal Submission

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 your project has been approved for scheduling, generate Scheduling Blocks from Science Goals and submit

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

- Maximum of 5 Science Goals per proposal
- Sources can be designed by fixed RA and Dec, or can include moving targets (including the planets, their moons, asteroids and comets)
- Sources selected:
  i. by specifying one or more source positions (= Multiple Pointings)
  ii. by specifying a single Rectangular Field (= Mosaic)
- The total number of pointings in a proposal must be less than or equal to 150. The ACA pointings do not count against the 150 pointing proposal limit.

Rectangular Field (= Mosaic) Constraints

- One Rectangular Field is allowed per Science Goal: at most 5 Rectangular Fields are allowed per proposal
- A single Mosaic can have up to 150 pointings
- If ACA observations are requested as part of a mosaic, then a corresponding ACA mosaic will also be observed

Multiple Sources Constraints

Users can request to observe up to 15 individual sources in a single Science Goal, provided that the sources:

- are not separated by more than 15 degrees on the sky
- can be observed with one Spectral Setup (placement and properties SPWs)
- can be observed with no more than 5 separate velocities that fall within the same Receiver Band

Offset Pointings Constraints

Offsets can be specified for all sources within a Science Goal, within 15 degrees separation, and the total number of positions in the proposal must be less than or equal to 150.

- If ACA observations are requested for the SG, then the corresponding ACA observations will be obtained for each source

- A set of N offset pointings will take longer to observe than N sources at the same sky positions: If the use of offset pointings is not well justified, then the proposal may be rejected on technical grounds

What you don't ask for

- Time on source: The OT reports an estimated time based on likely weather:
  Observations will proceed until sensitivity is reached

- Calibration sources

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

  ii. Own calibrators can be requested:
  You must fully justify it in the proposal!

OT

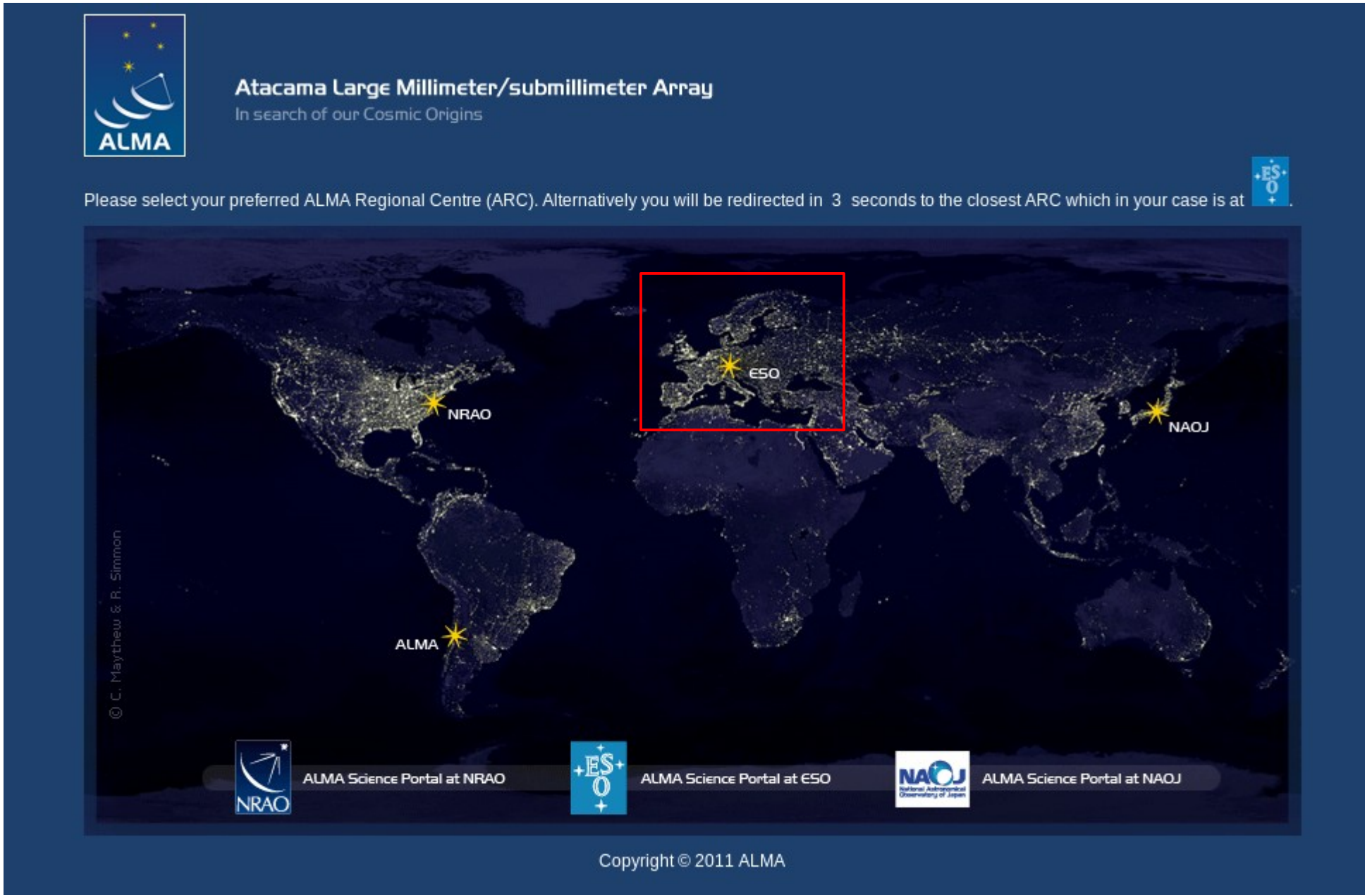
- The OT is a Java application
    i. Java 6 must be installed on your computer

- 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

Login & Registration

Atacama Large Millimeter/submillimeter Array
In search of our Cosmic Origins

Search Site

ESO NRAO NAOJ

Log in | Register | Reset Password | Forgot Account

- About ALMA
- ALMA Science
- Call for Proposals
- ALMA Data
- Documents & Tools
- Knowledgebase/FAQ

User Services at ARCs

- Helpdesk
- EU ARC
- NA ARC
- EA ARC

OT

You are here: Home

Welcome to the 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 will be 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. 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

ALMA Newsletter

Newsletter No. 9
May 23, 2012

More…

General News

ALMA Cycle 1 Call for Proposals is now open
May 31, 2012

New Release of Band 9 Science Verification Data
May 31, 2012

Third installment of Science Verification data
Apr 13, 2012

Pre-announcement for Cycle 1
Apr 03, 2012

More…

The OT

Atacama Large Millimeter/submillimeter Array
In search of our Cosmic Origins

Search Site

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- About ALMA
- ALMA Science
- Call for Proposals
  - Capabilities
  - Road Map
  - Proposers Guide
  - Technical Handbook
  - Observing Tool
    - Web Start Download Page
    - Tarball Download Page
    - OT Video Tutorials
    - Troubleshooting
  - Sensitivity Calculator

You are here: 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 1* release of the OT is configured for the Early Science Capabilities of ALMA as described in the Cycle 1 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: Web Start and tarball.

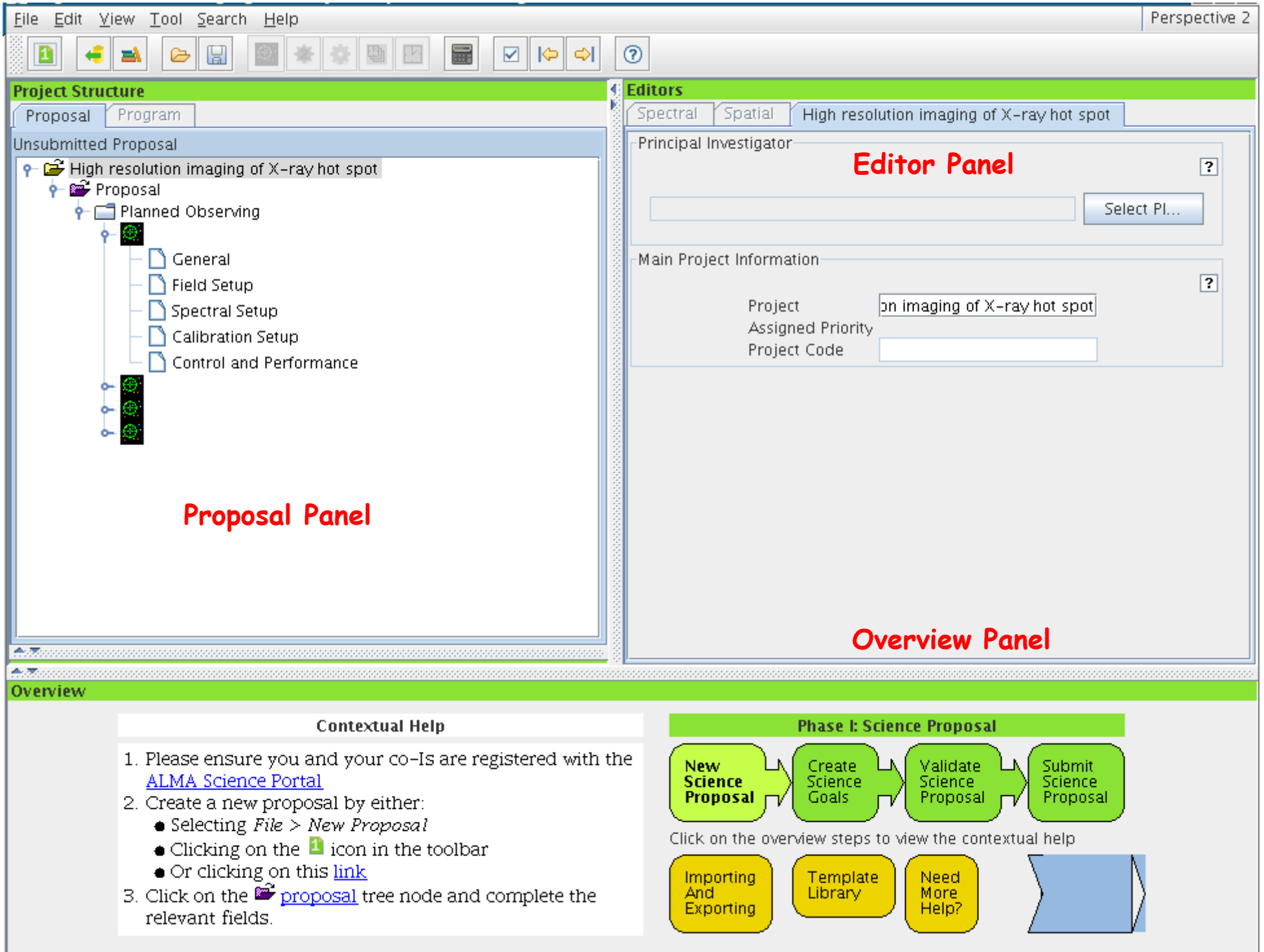
The **Web Start** application is the recommended way of using the OT. It has the advantage that the OT is automatically downloaded and installed on your computer and it will also automatically detect and install updates. There are some issues with Web Start, particularly that it does not work with the Open JDK versions of Java such as the "Iced Tea" flavour common on many modern Linux installations. The Sun/Oracle variant of Java should therefore be installed instead. If this is not possible, then the tarball installation of the OT is available.

The **tarball** version must be installed manually and will not automatically update itself, however there should be no installation issues. For Linux users, we also provide a download 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

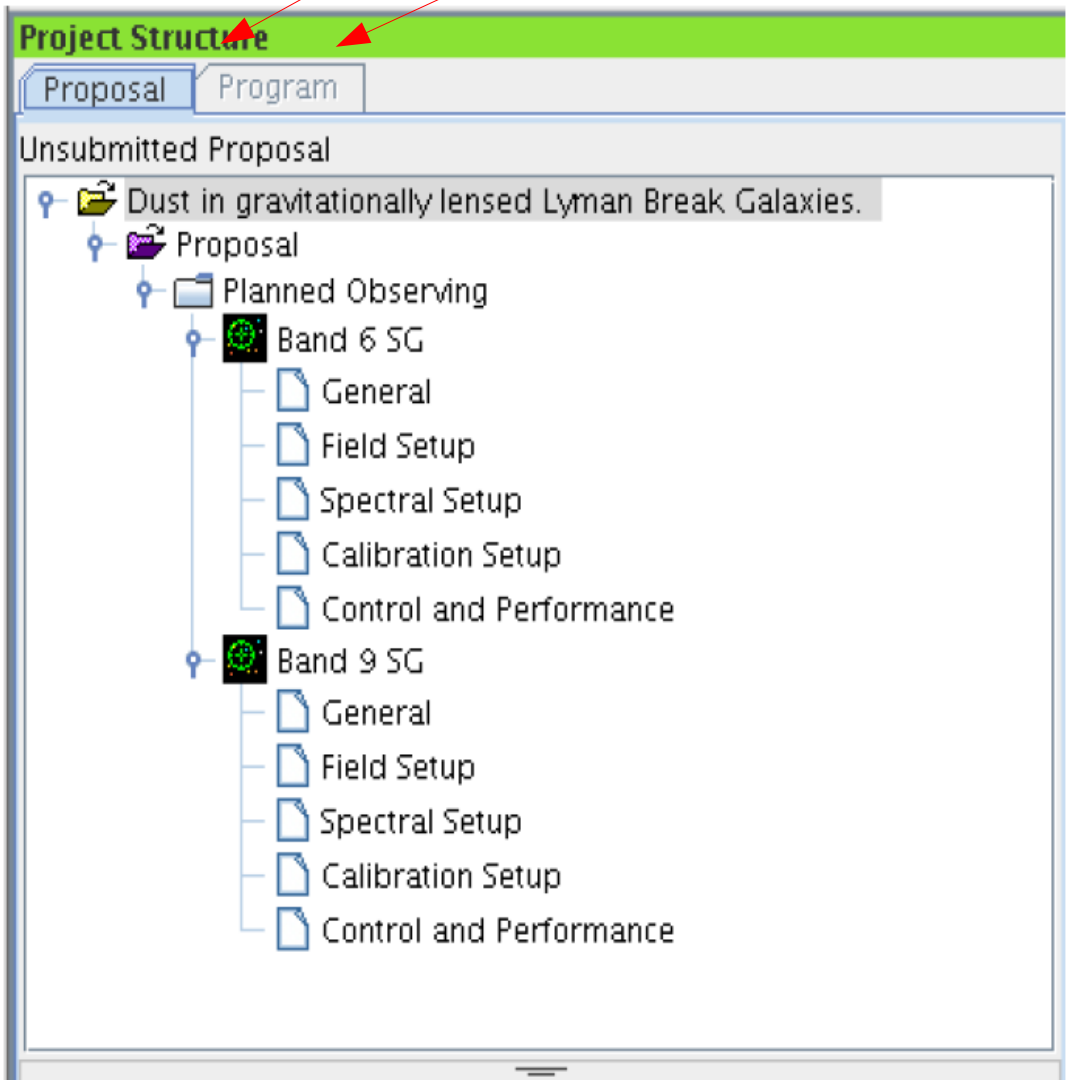
OT structure

Menu and Toolbar



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. General description of the SG

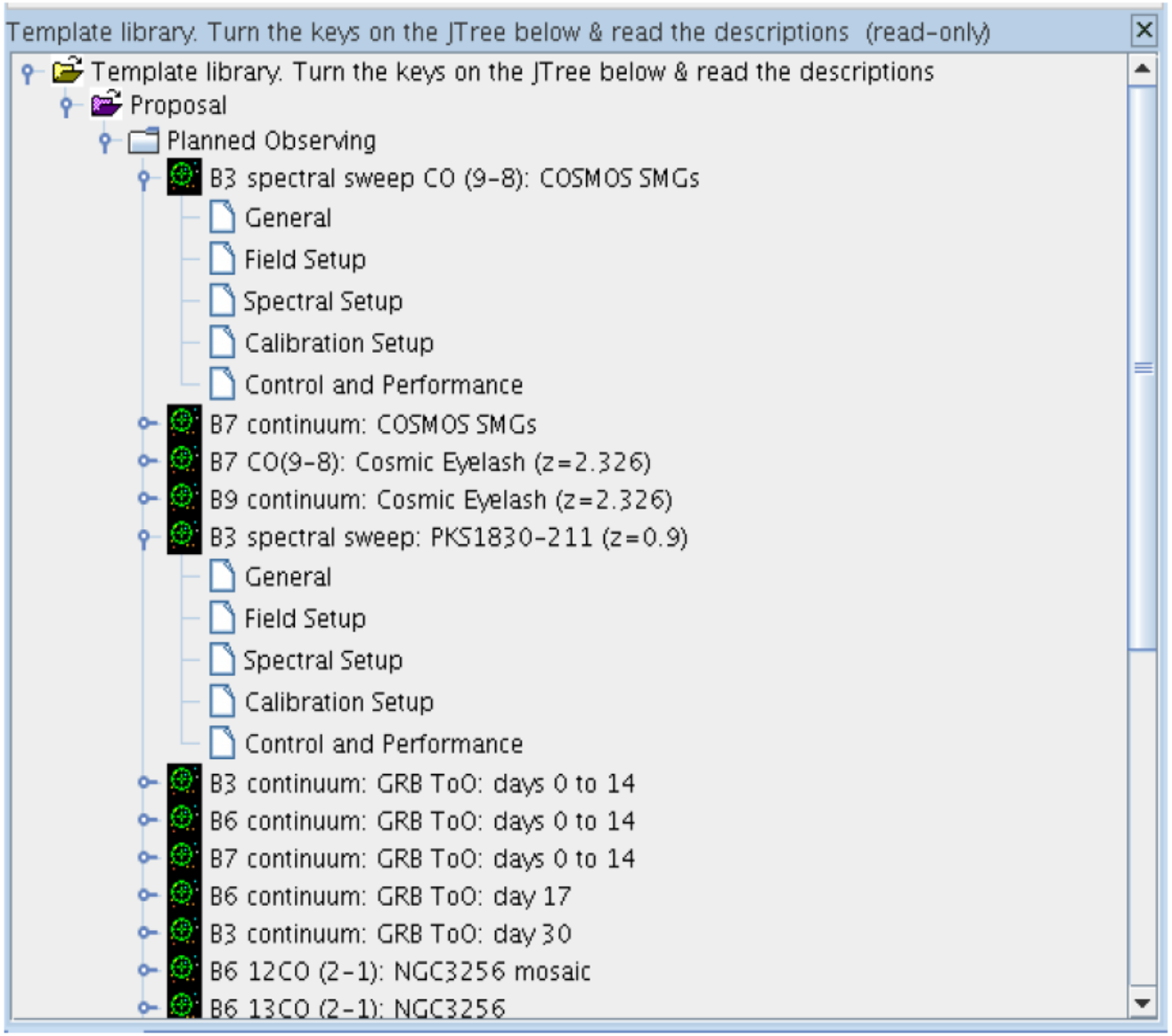
ii. the Field Setup to define the observing targets

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

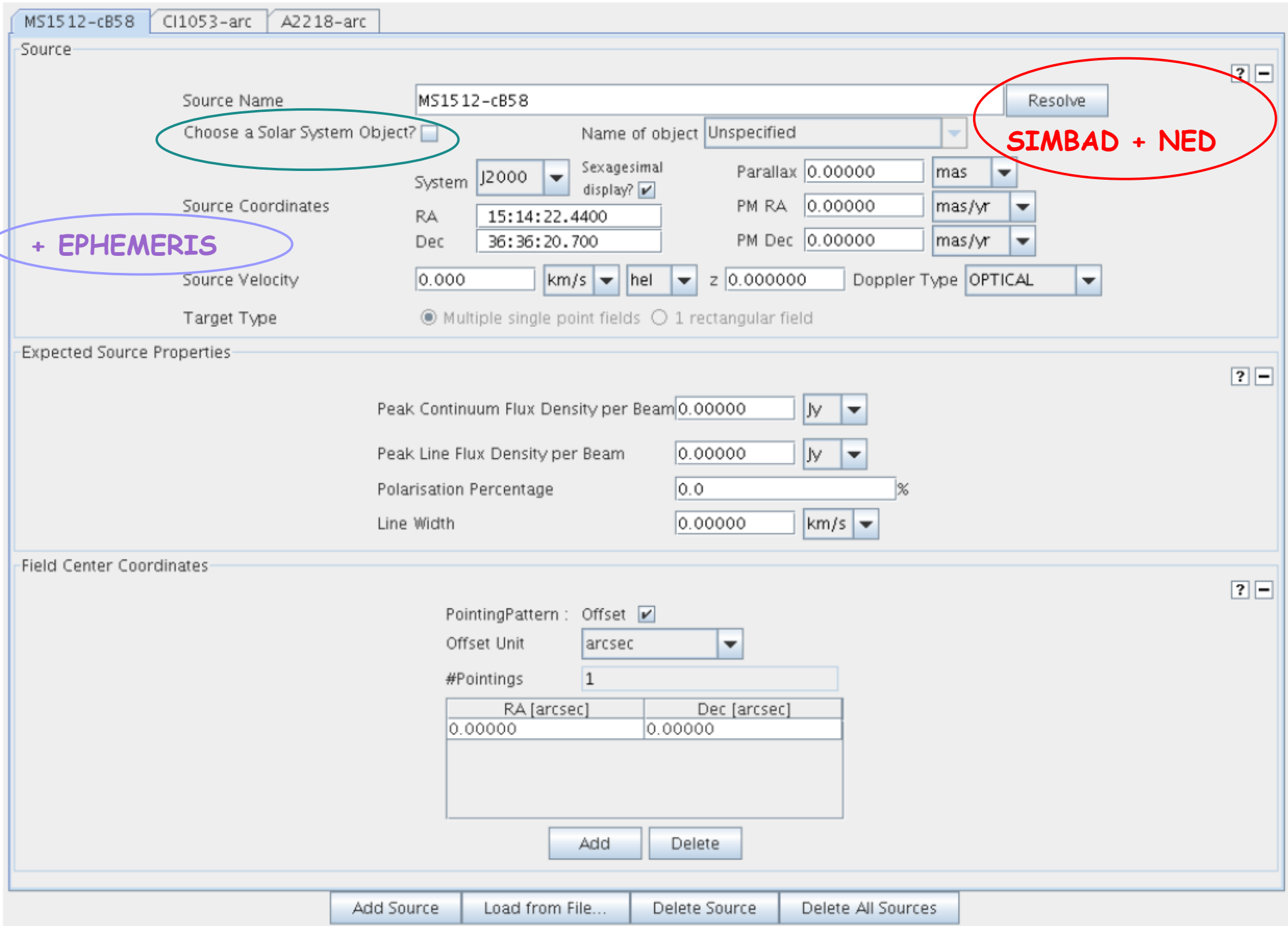
The ALMA Template Library



It provides a set of Science Gaols that cover different proposal types.

Possibility to drag and copy the full Science Goal!

The Field Setup



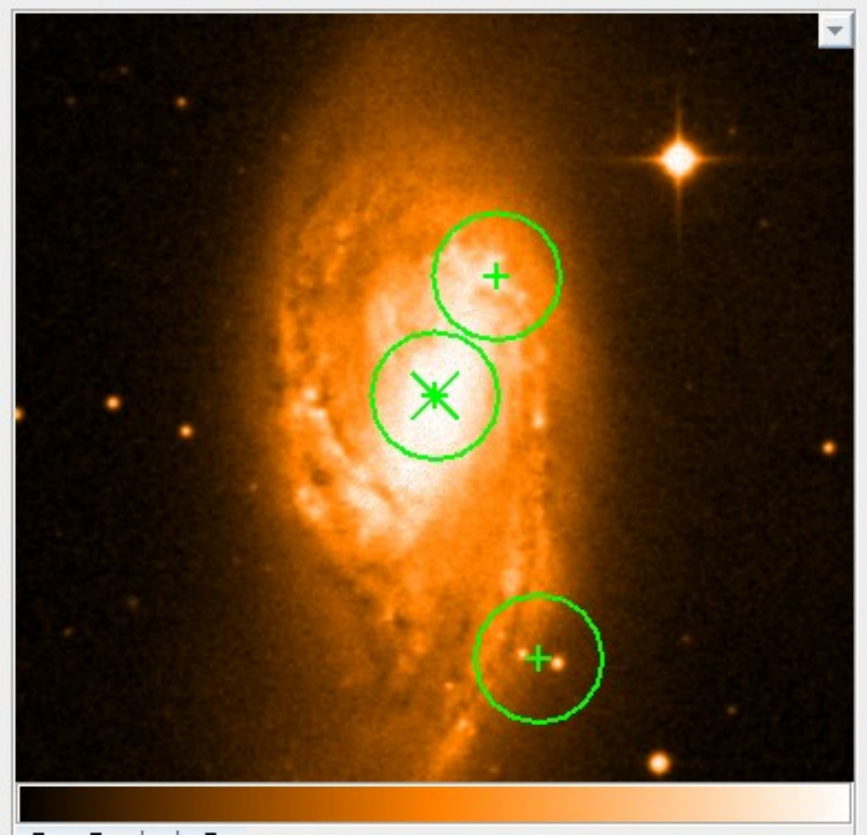
The Visual Spatial Editor

Downloads and displays an image of the sky

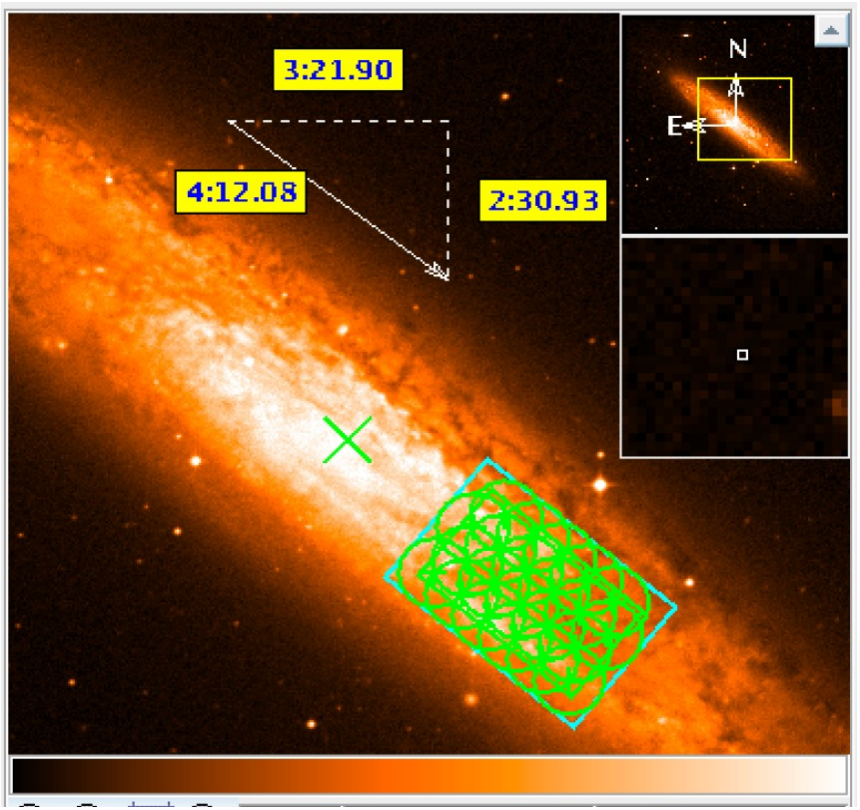
i. Libraries provided by JSky project

ii. Local images files (FITS)

Multiple Pointings

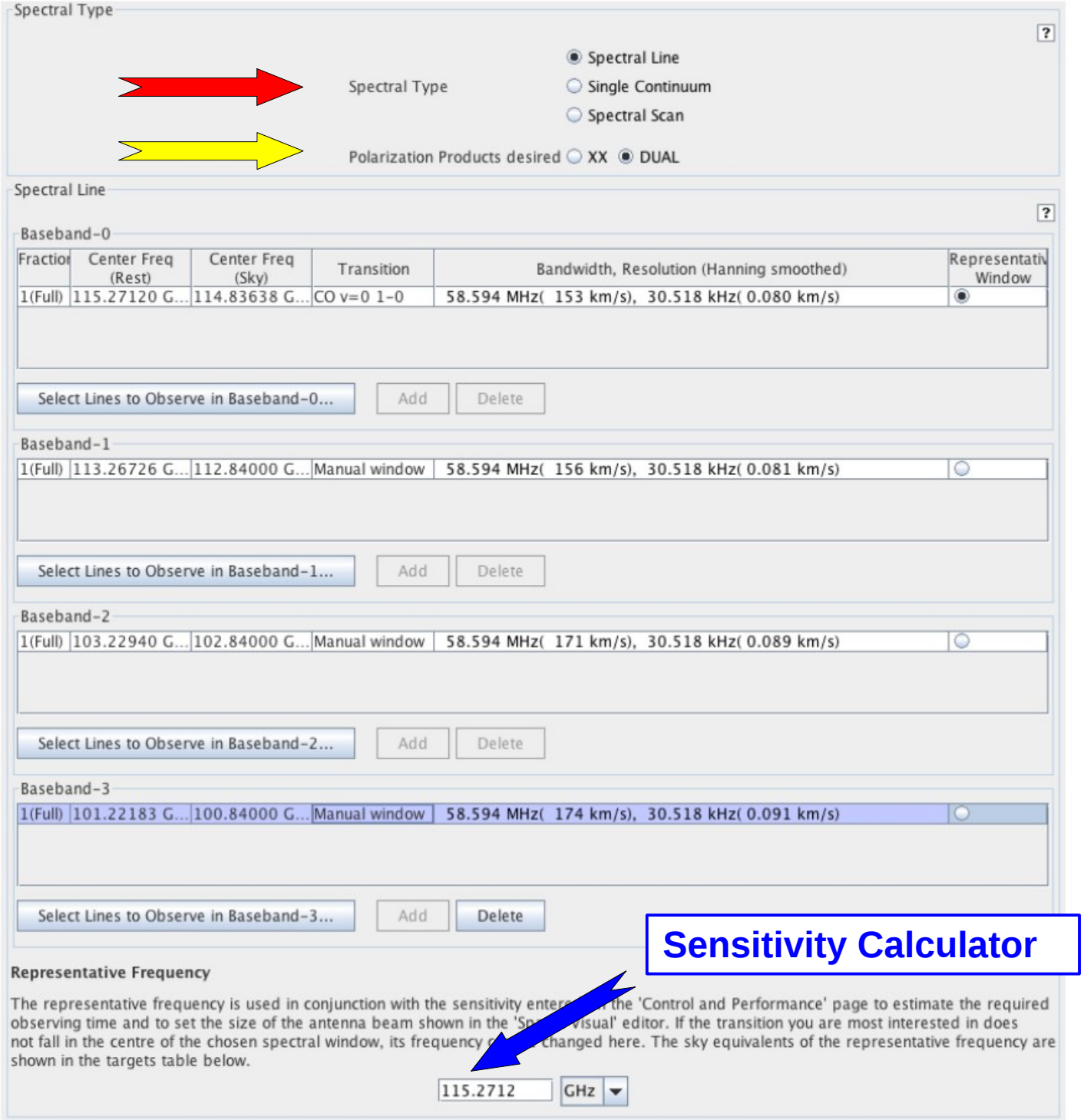


Mosaic



It is not possible to perform a mixture of Multiple Pointings and Mosaic

Spectral Setup



Baseband-0: one SPW

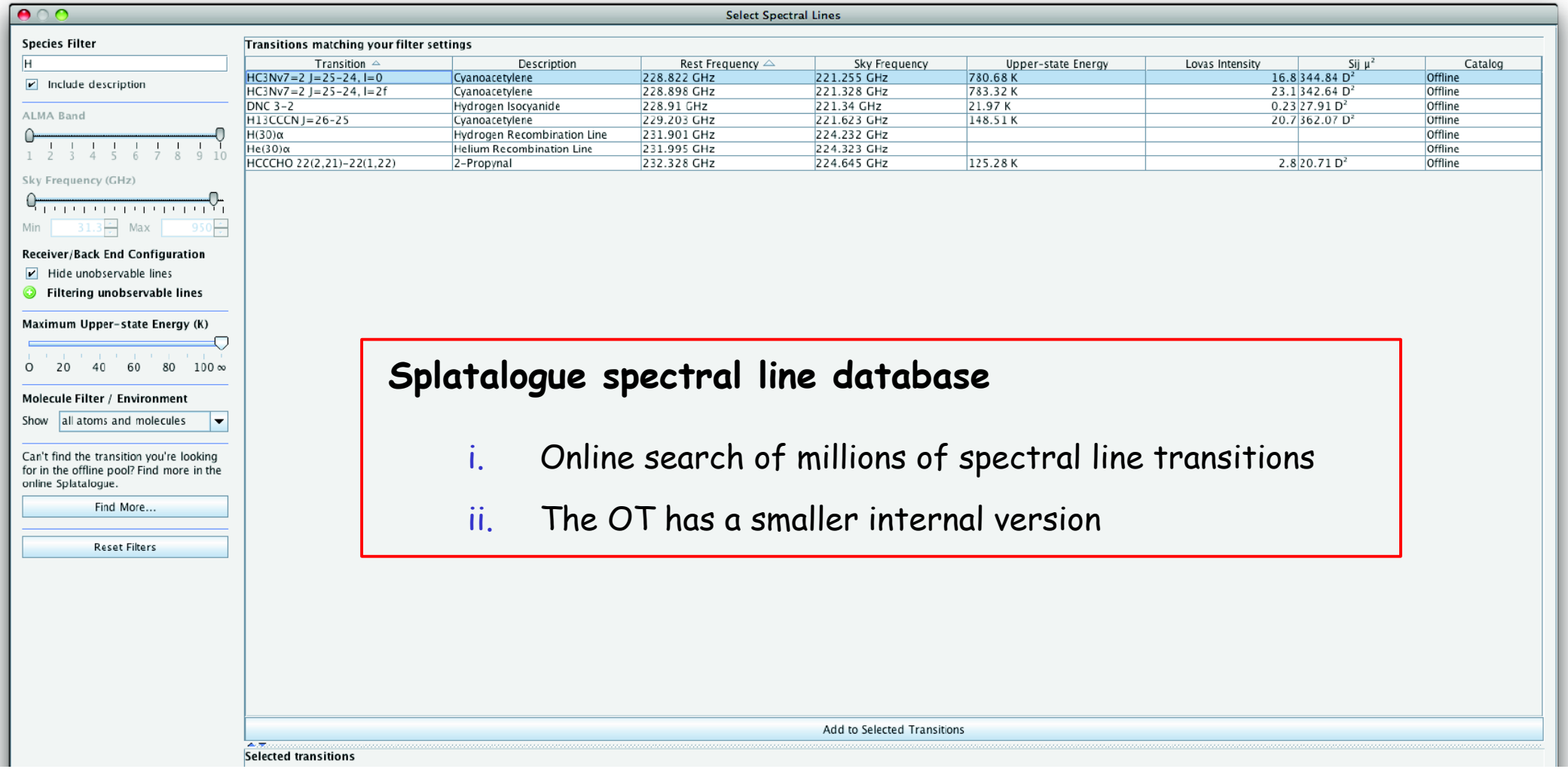
Baseband-1: one SPW

Baseband-2: one SPW

Baseband-3: one SPW

Sensitivity Calculator

Spectral Line Selection Tool

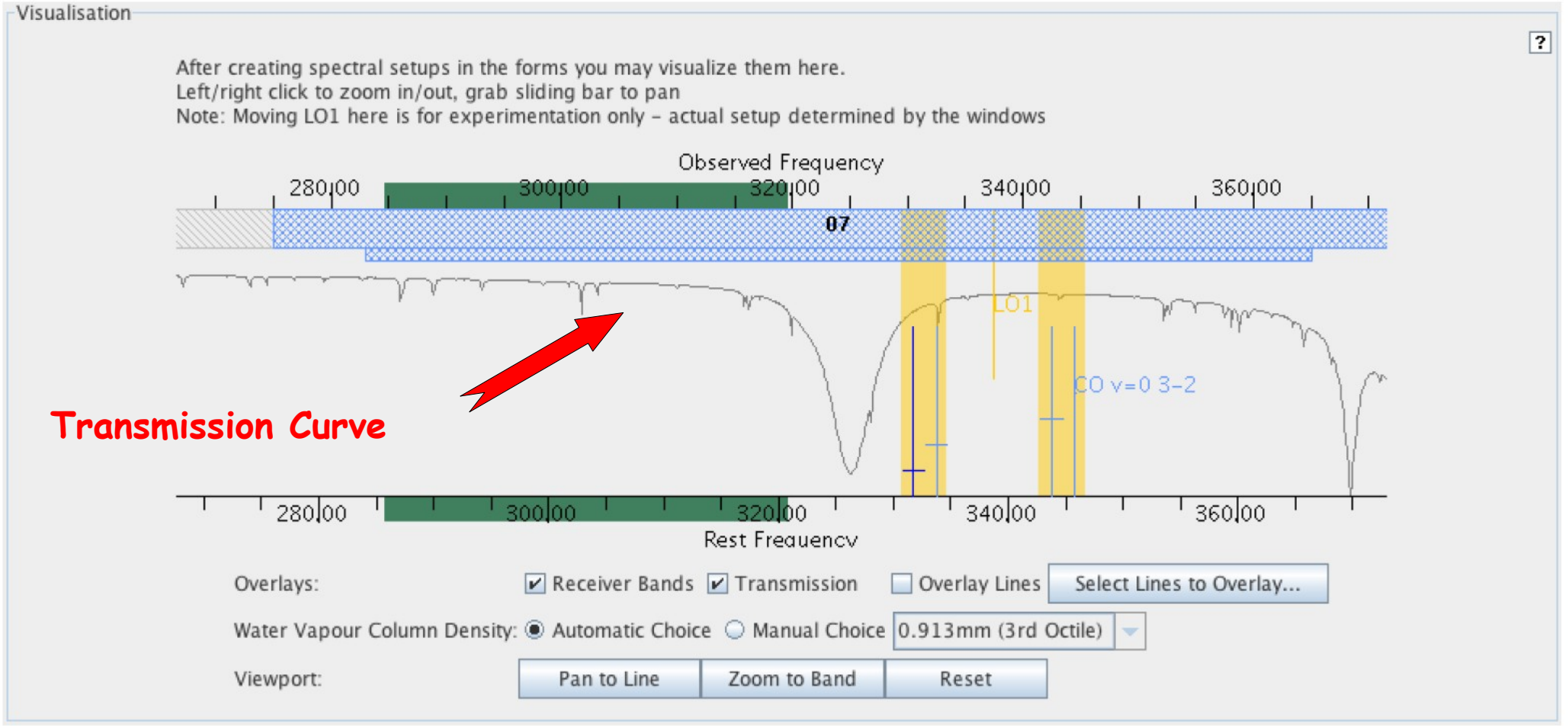


Splatalogue spectral line database

i. Online search of millions of spectral line transitions

ii. The OT has a smaller internal version

The Visual Spectral Editor



Calibration Setup

The "System-defined calibration" is STRONGLY recommended

Goal Calibrators

Select *User-defined calibration* to choose your own calibrators, or *System-defined calibration* to let the system automatically select the calibrators to be observed.
We **STRONGLY** suggest that you leave this choice at 'System-defined' – the Observatory will ensure that suitable calibrators are selected.

- ○ System-defined calibration
- ◉ User-defined calibration

- When first selected, the table shows a reasonable set of calibrators to include.
- *Dynamic Calibrators* are found by a source catalogue query executed at project execution time. Edit the query with *Edit Criteria...*.
- *Fixed Calibrators* are calibrators specified now, at project creation time. Specify which calibrator should be observed with *Edit Target...*.

Add Dynamic Calibrator... | Add Fixed Calibrator... | Delete Selected Calibration

Calibration Intent	Target Type	Source Name	RA	Dec	
Pointing	Dynamic Calibrator		17:56:21.287 ± 20.0...	-21:57:21.877 ± 20....	Edit Criteria...
Atmospheric	Dynamic Calibrator		17:56:21.287 ± 20.0...	-21:57:21.877 ± 20....	Edit Criteria...
Amplitude	Dynamic Calibrator		17:56:21.287 ± 20.0...	-21:57:21.877 ± 20....	Edit Criteria...
Pointing	Dynamic Calibrator		17:56:21.287 ± 20.0...	-21:57:21.877 ± 20....	Edit Criteria...
Bandpass	Dynamic Calibrator		17:56:21.287 ± 20.0...	-21:57:21.877 ± 20....	Edit Criteria...
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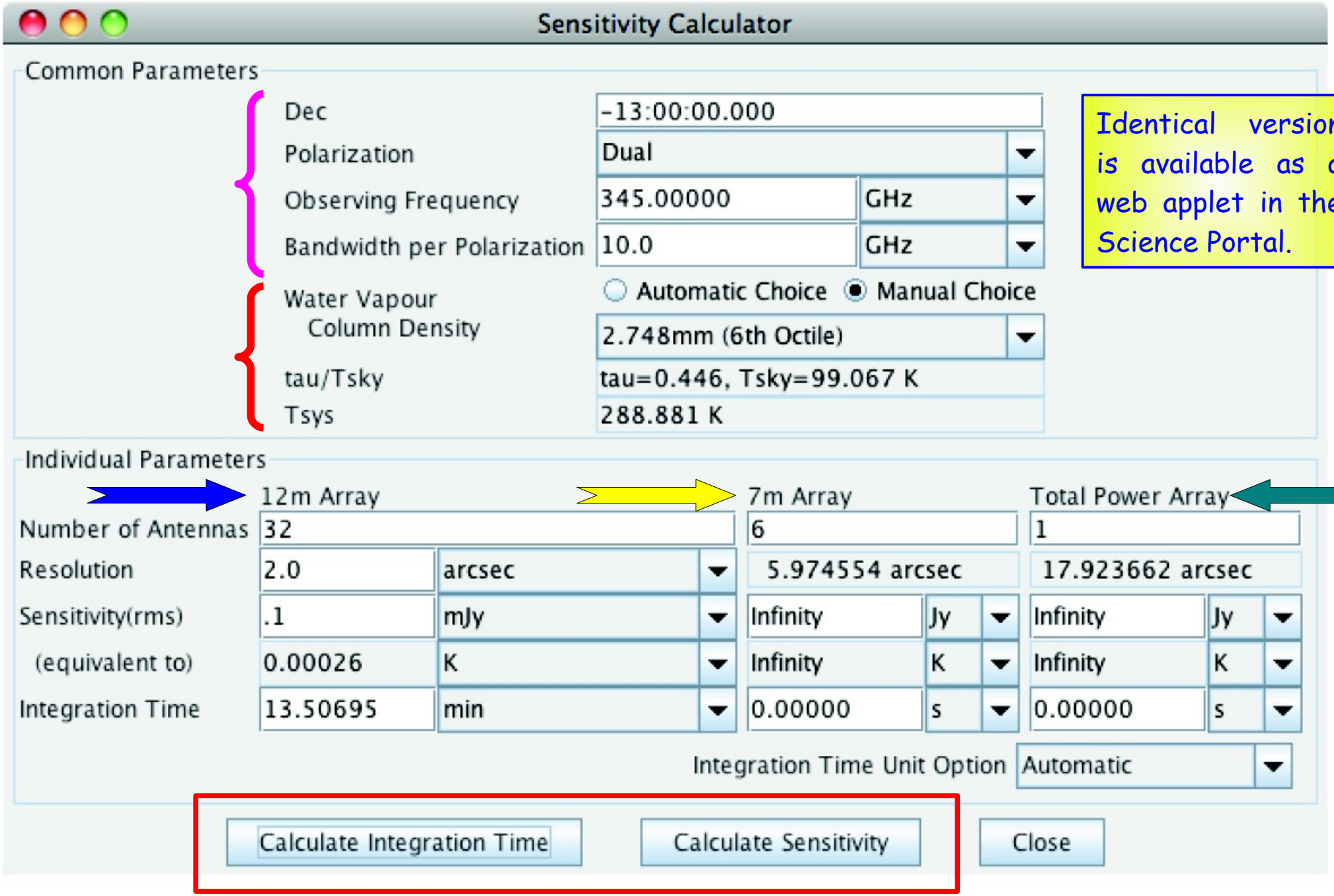
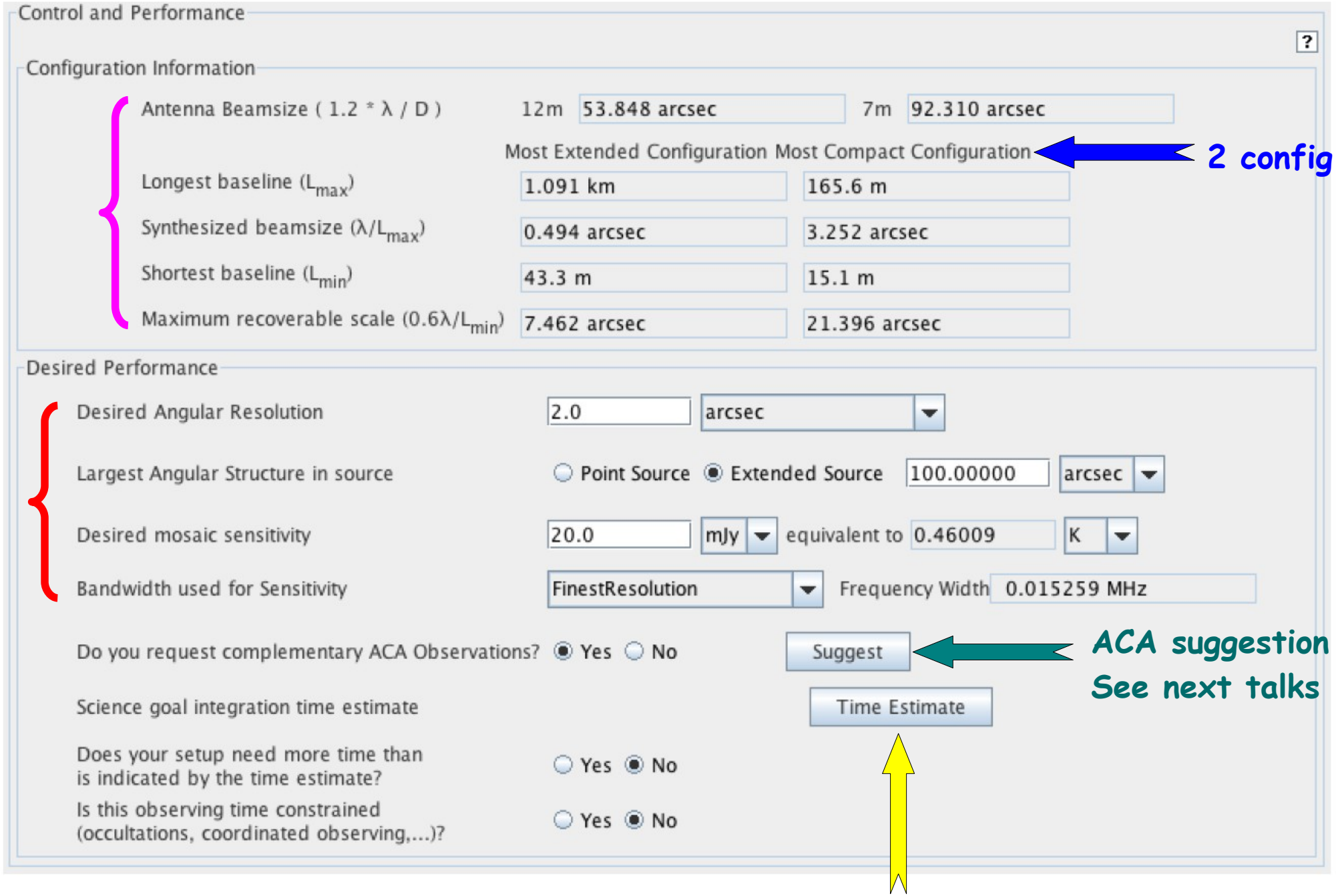
Pointing	Dynamic Calibrator		17:56:21.287 ± 20.0...	-21:57:21.877 ± 20....	Edit Criteria...
Phase	Dynamic Calibrator		17:56:21.287 ± 20.0...	-21:57:21.877 ± 20....	Edit Criteria...
Bandpass	Dynamic Calibrator		17:56:21.287 ± 20.0...	-21:57:21.877 ± 20....	Edit Criteria...
Amplitude	Fixed Target	Uranus	N/A	N/A	Edit Target...

Sensitivity Calculator



Control and Performance



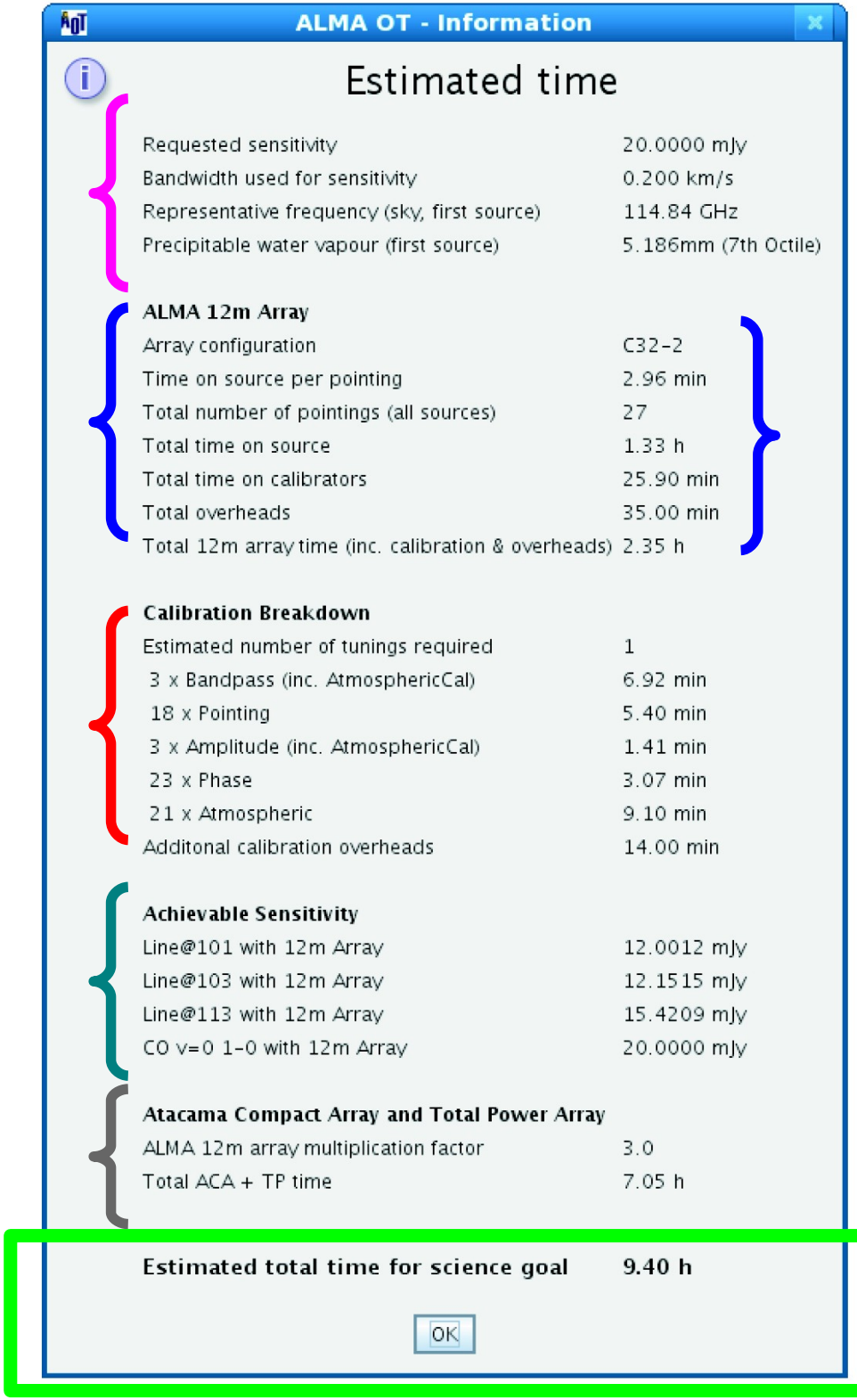
Requested rms
Representative Freq.

Configuration
Total number of pointings

Calibration

Achieved Sensitivities

ACA + TP Time



Time on source
Time on calibrators
Total overheads

Summary Information, Validation and Submission

- Once the proposal is complete, various pieces of summary info can be obtained:

  i. SG summaries

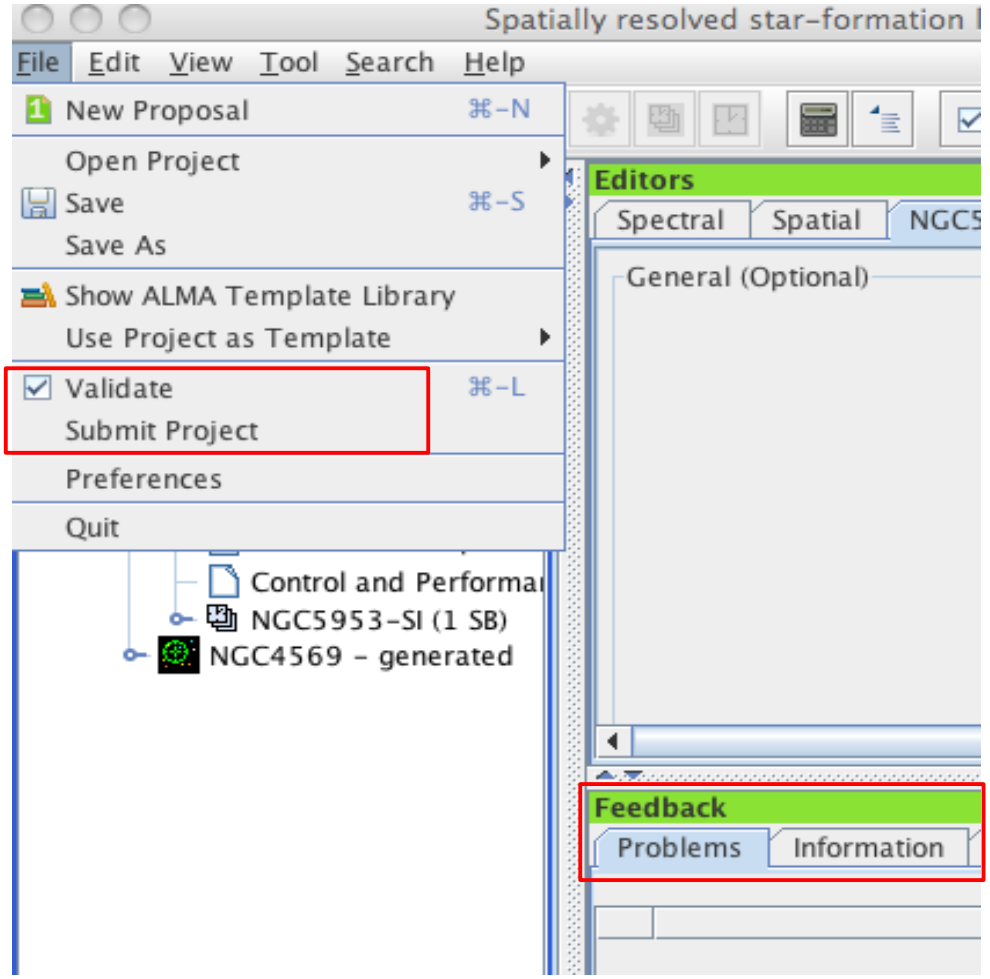
  ii. Proposal summary

  iii. Technical Assessment Flag sheet

  iv. Whole Proposal

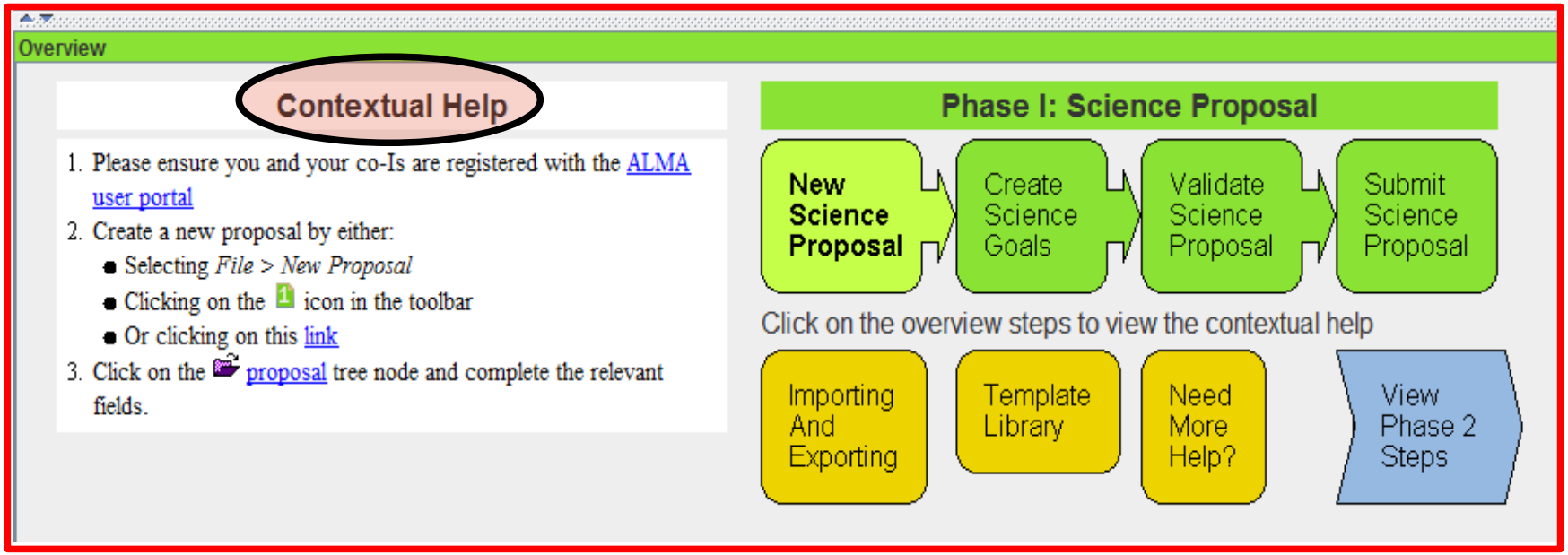
- Validation: see Feedback Panel. If the validation is not successful, submission will fail

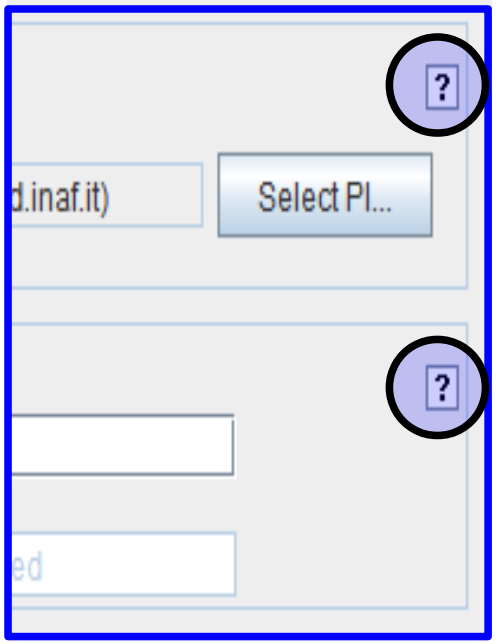
- Submission and Resubmission: an email will be sent to all investigators



The OT may validate observations not compilant with Cycle 1 capabilities: these proposals will be rejected!

Documentation & Help





ALMA SCIENCE PORTAL:

OT User Manual

OT Video Tutorial

For any questions on OT, ALMA data reduction, ...
contact the ALMA Helpdesk @ the ALMA SCIENCE PORTAL:

http://almascience.org

submitting a ticket to the ALMA Helpdesk
(and specifying your preferred ARC)

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

Enjoy your *Cycle 1* ALMA proposal!

Deadline: 15:00 UT on July 12, 2012