An introduction to ALMA and the AOT

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ALMA

ALMA is a submm telescope designed to observe at 0.32-9.5mm (31-950 GHz)

- It is located in Chile at 5000 m of altitude

- 66 reconfigurable high-precision antennas

- angular resolution as small as 0.005”

- velocity resolution 0.008 km/s

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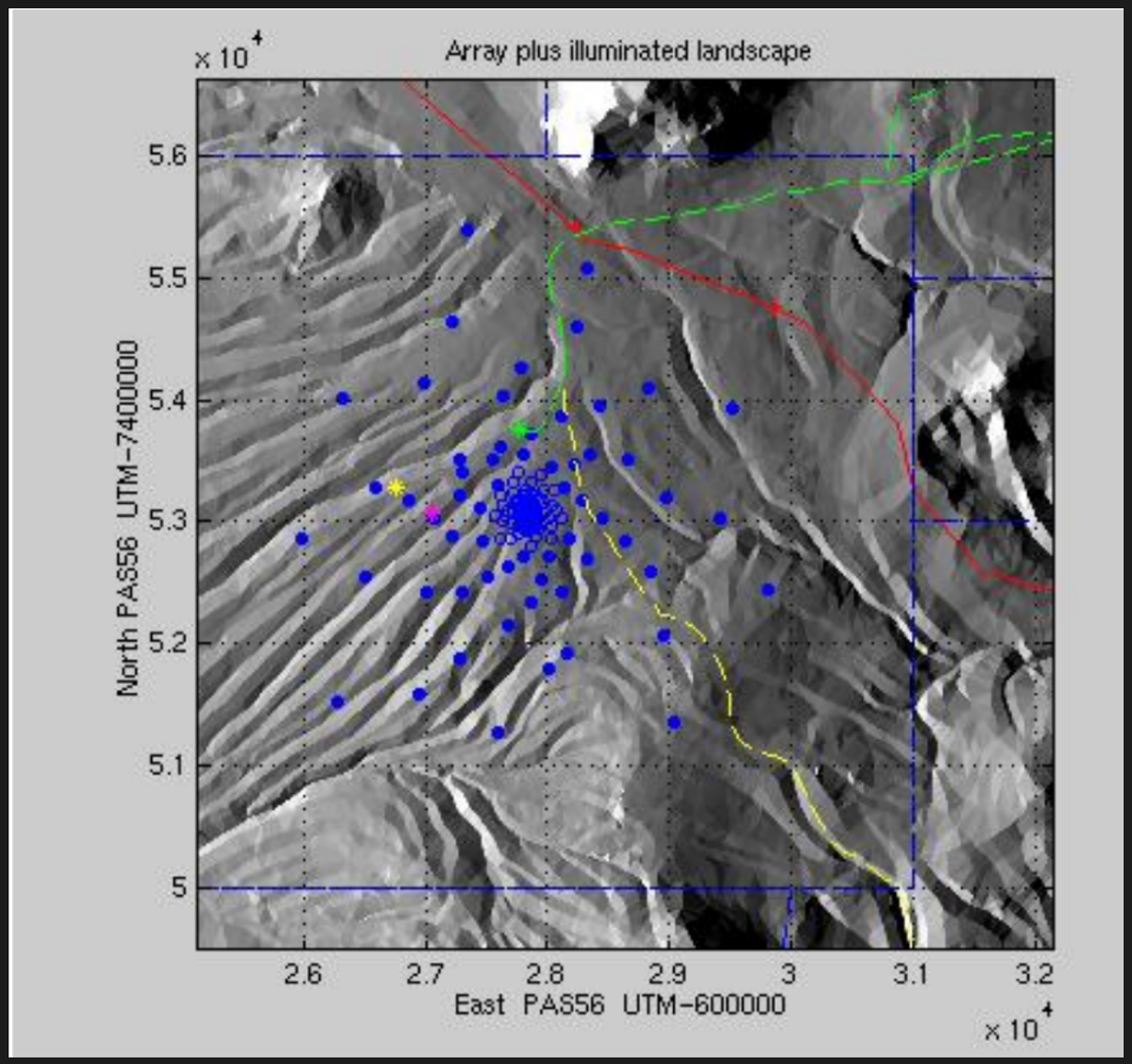
- maximum baseline from 150 m to 16 km



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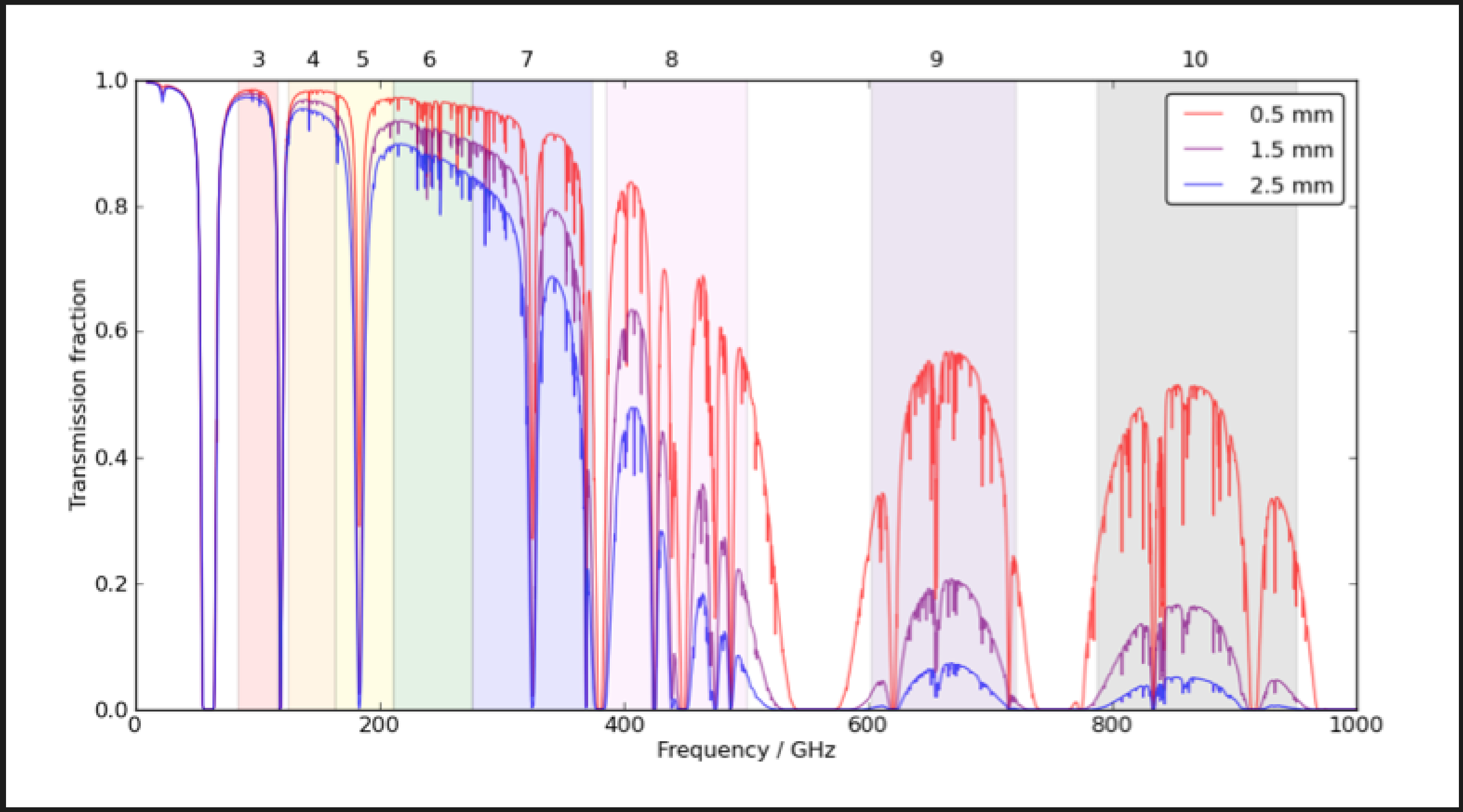


ALMA

The design of ALMA has 3 key goals:

1 - The ability to detect spectral line emission from CO or [CII] in a normal galaxy like the Milky Way at a redshift of z=3, in less than 24 hours

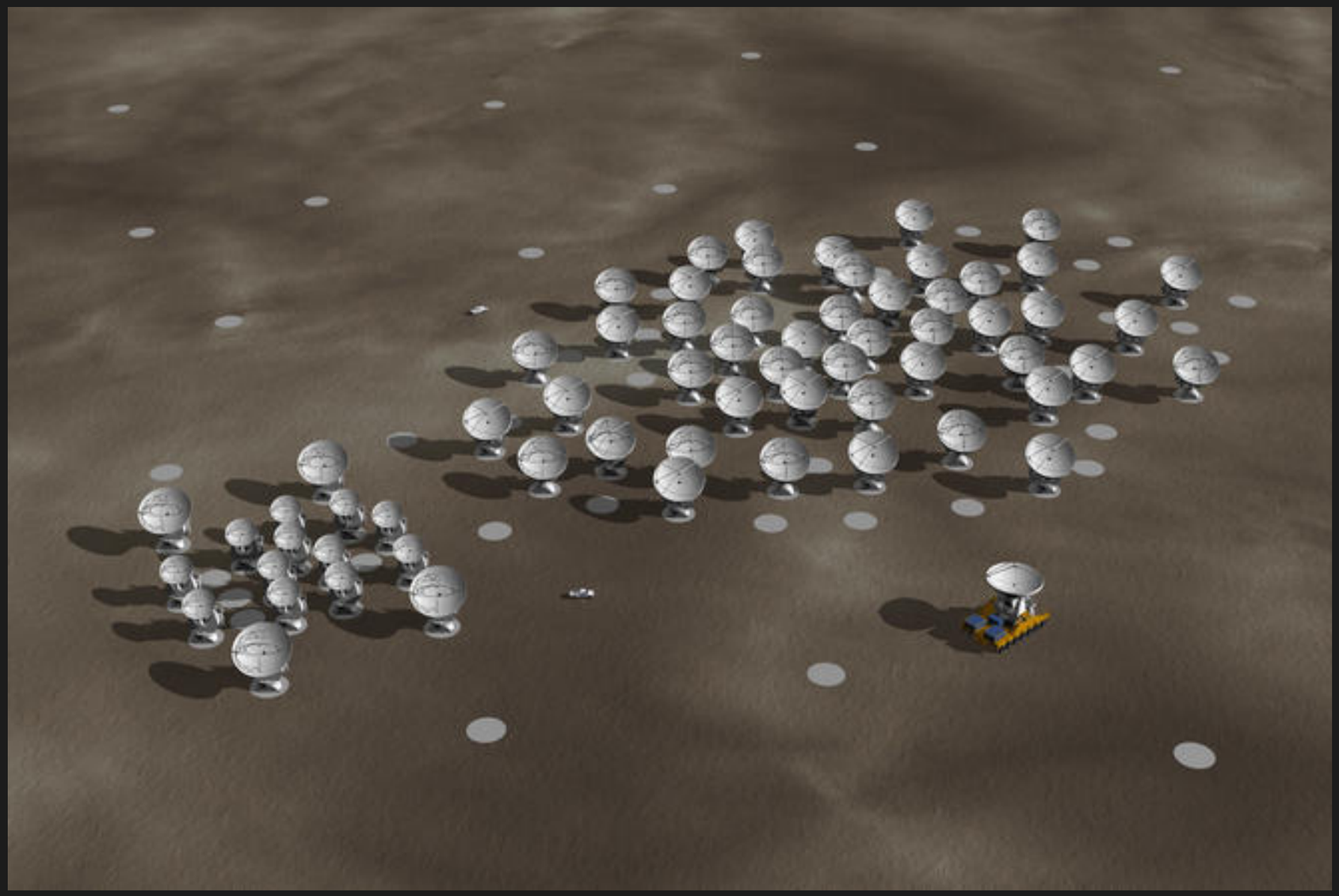
2 - The ability to image the gas kinematics in protostars and in protoplanetary disks around young Sun-like stars in the nearest molecular clouds (150 pc)

3 - The ability to provide precise high dynamic range images at an angular resolution of 0.1 arcsec.

ALMA

ALMA has 3 subarrays with different size structures:

- Main array: 50 ant. with D = 12 m
- ACA Atacama Compact Array (12 ant. with D = 7 m)
- The total power antennas (4 ant. with D = 12 m)



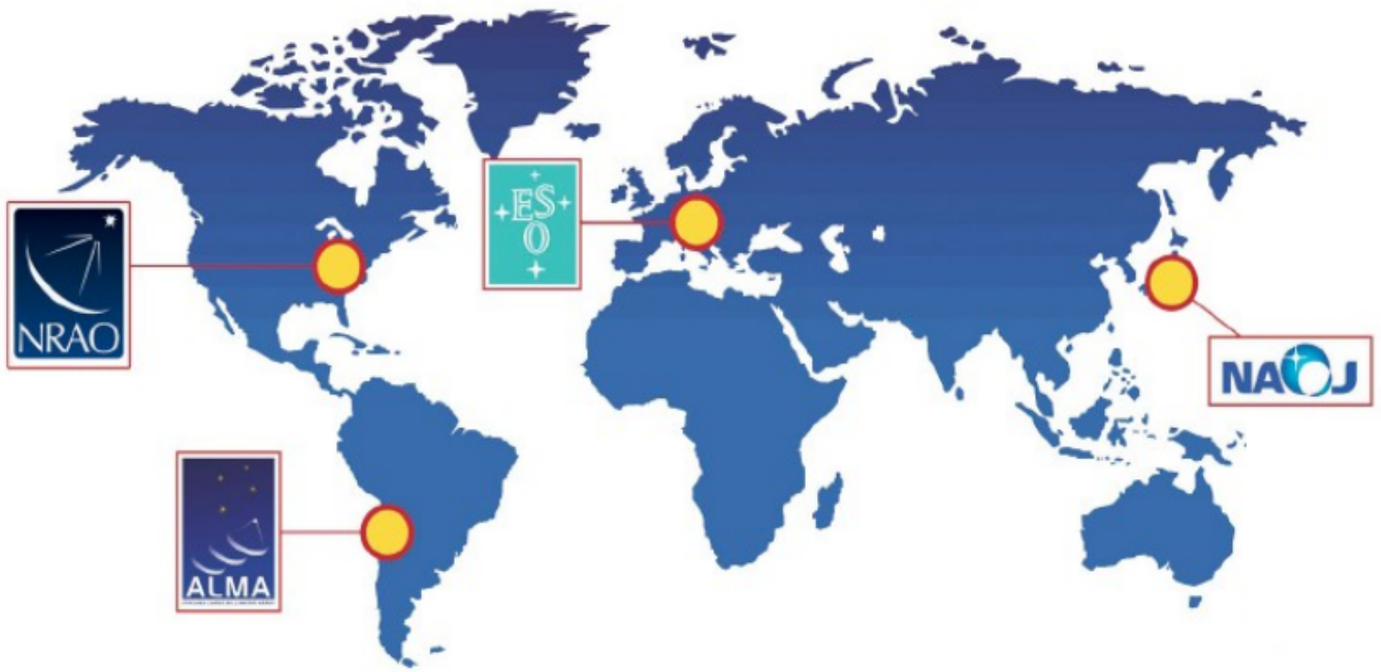
ALMA

The management of ALMA is quite complex because it involves 4 institutions, whose 3 pre-existed before ALMA, and had already their own internal management.

ALMA organization

ALMA is a world wide collaboration

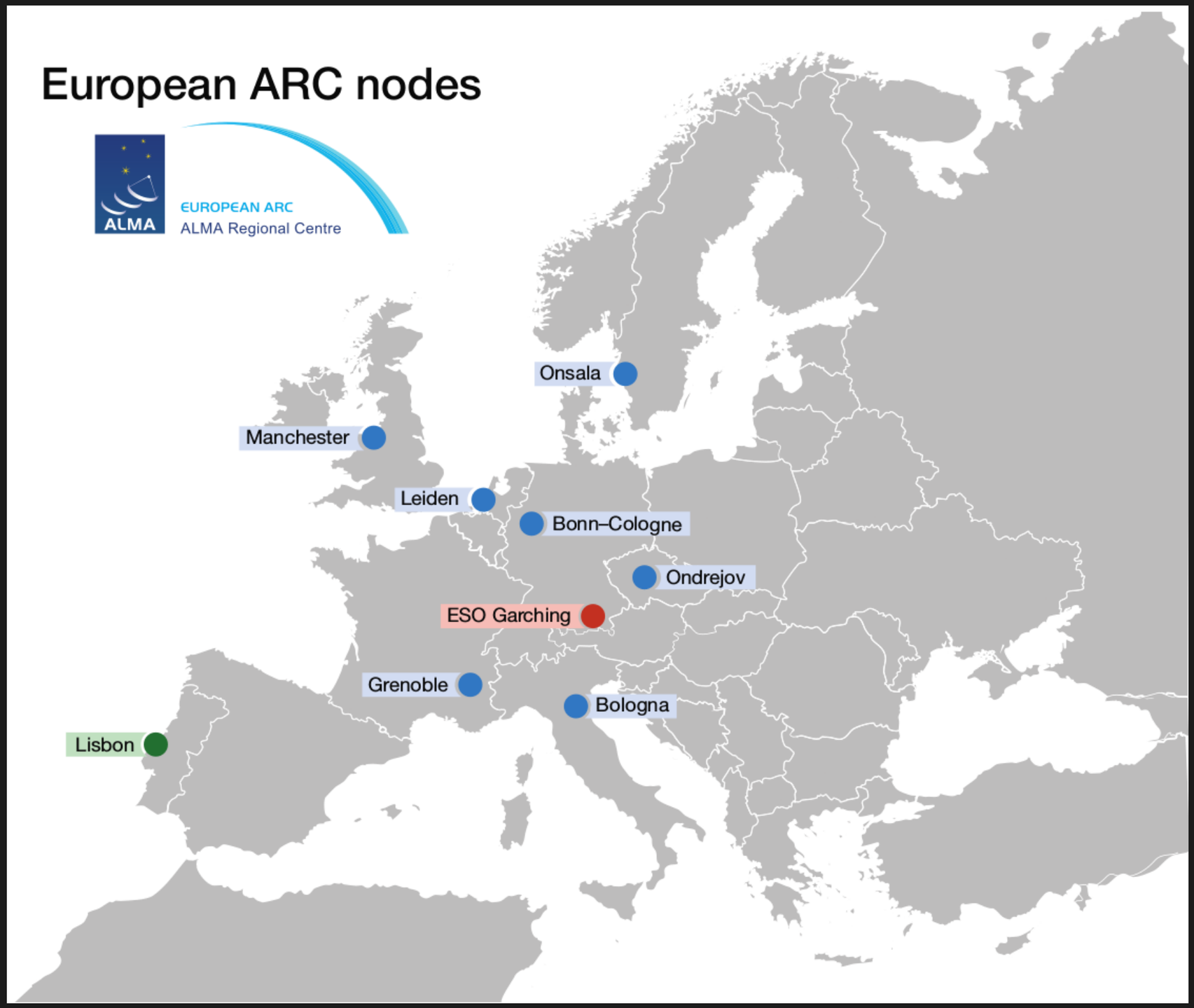
Contributors share the observing time an host a mirror of the archive



- Europe: **ESO** (14 countries) → 30%
- North America: **NRAO** (USA, Canada) → 30%
- East Asia: **NAOJ** (Japan, Taiwan) → 20%
- Chile → 10%

ALMA

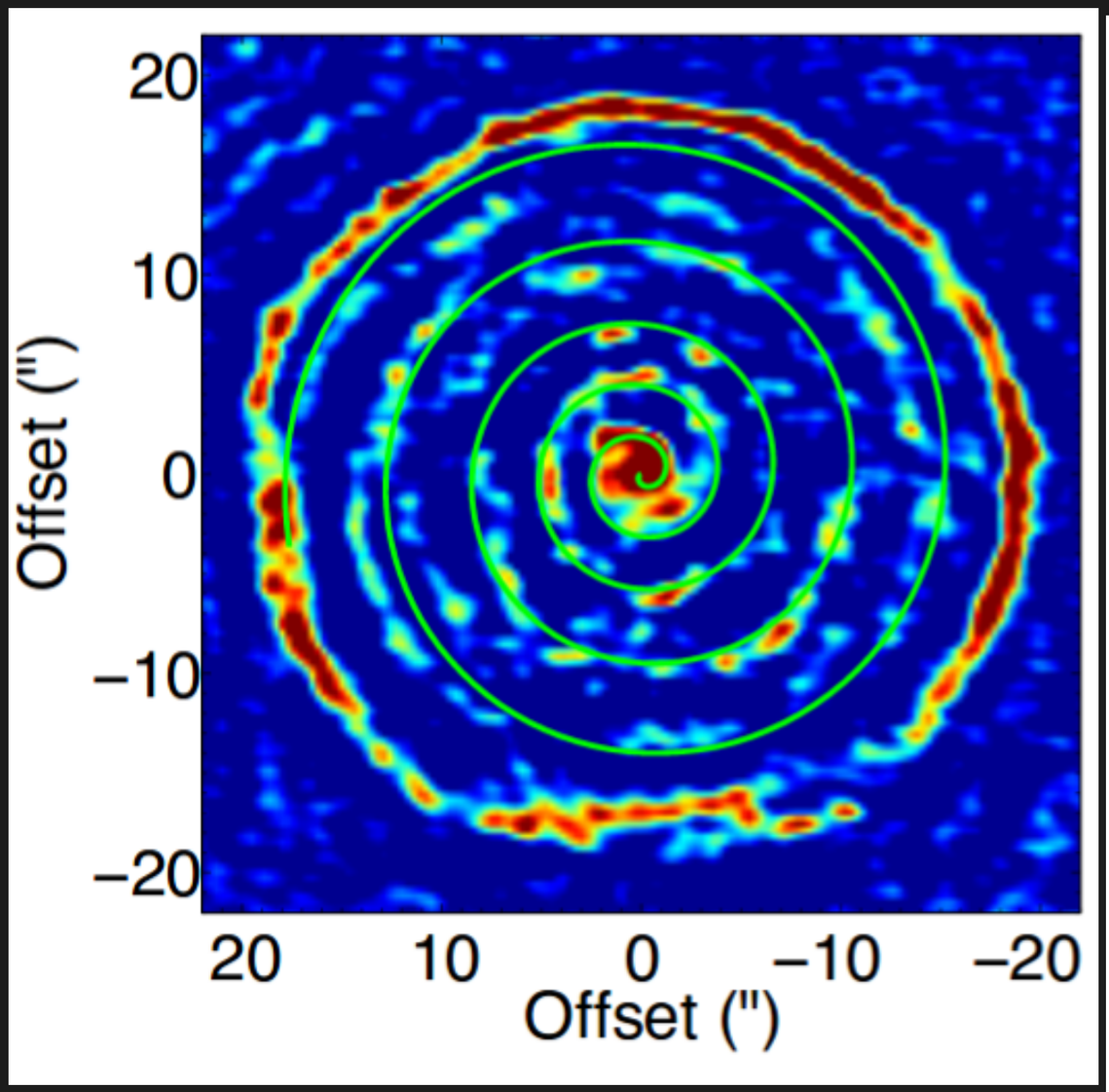
In this context Europe, i.e. the ESO, proposed a different approach, building a network of ALMA Regional Center, to optimize the different expertise developed within the different European countries

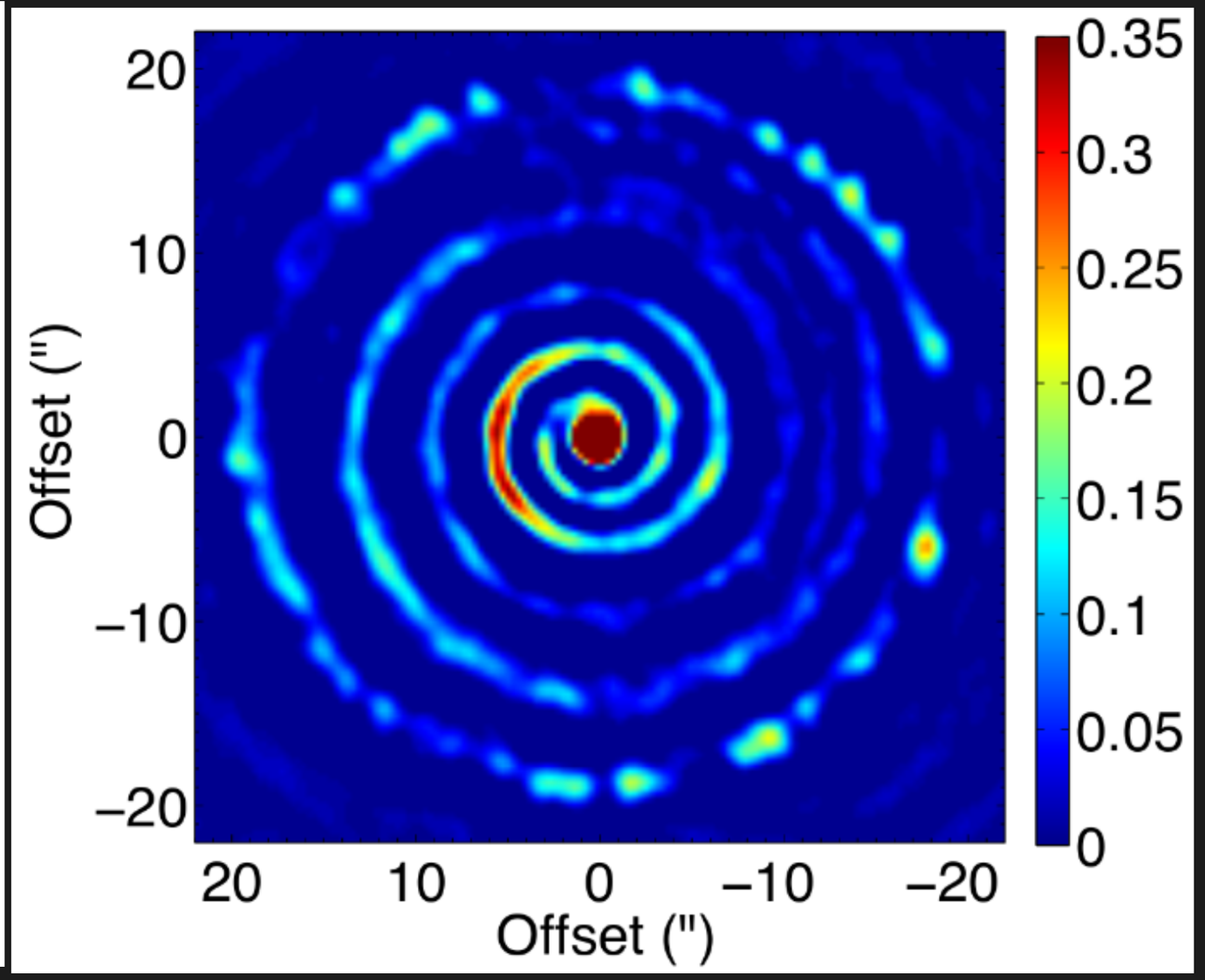


Does it worth the effort?

Highlight from ALMA

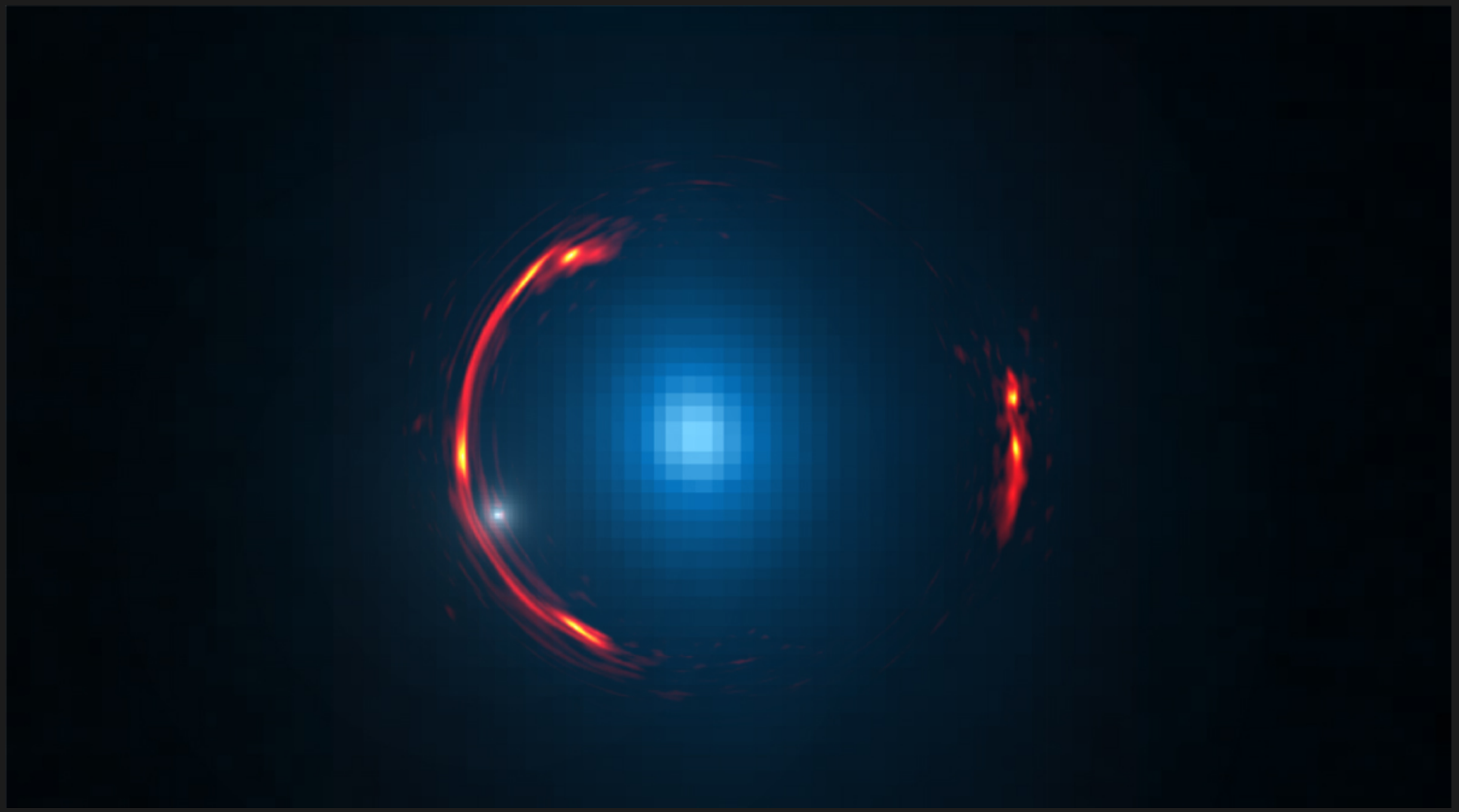
AGB star R Sculptoris loses shells of gas and dust during its thermal pulses phase.
15 ant. - 4 hs – Band 7 (CO 3-2) – Res 1.3”





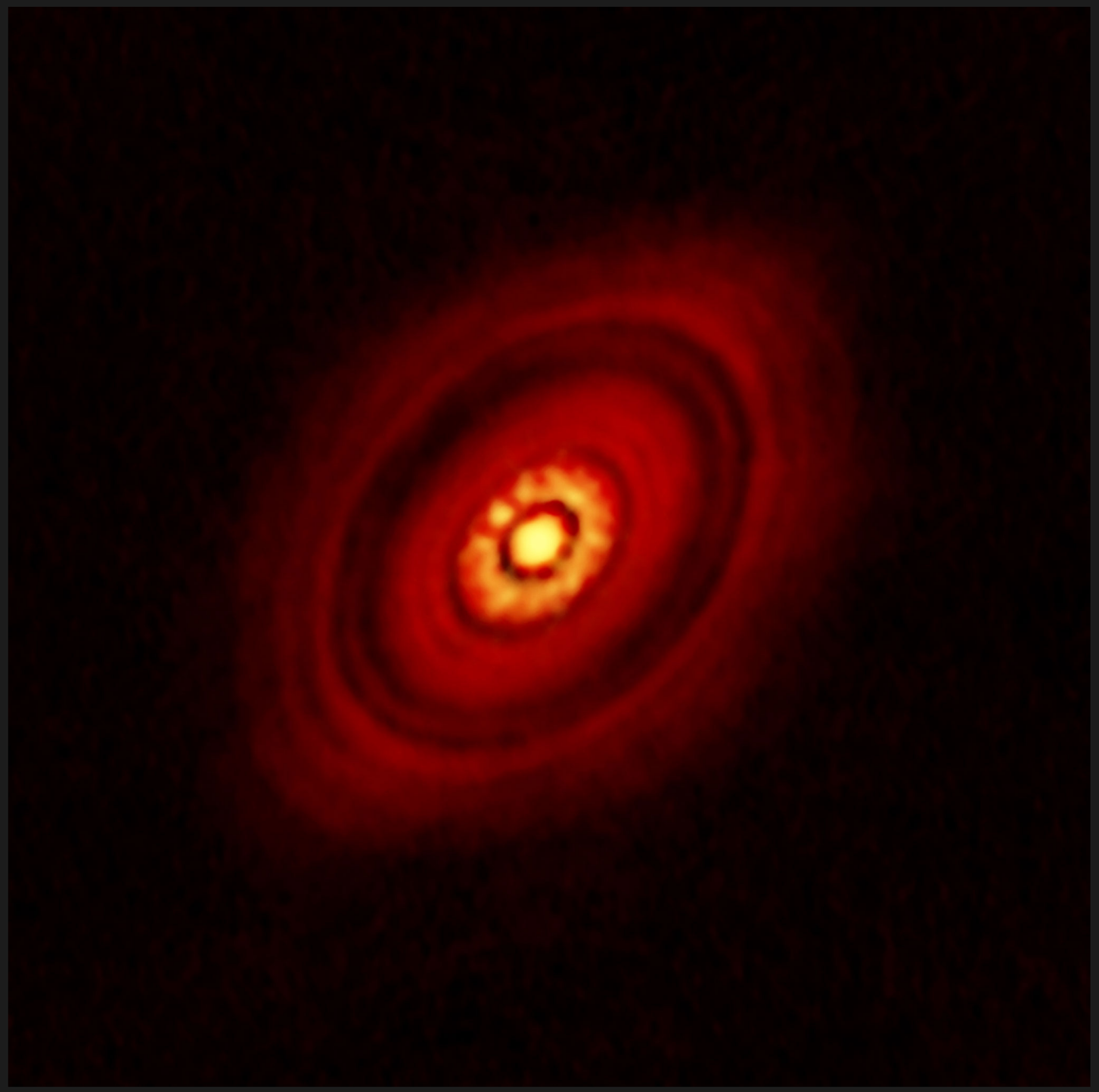
Highlight from ALMA

Lensed submm galaxy at z = 3.042 (lens at z = 0.299)
Long Baseline campaign – 31 x 23 mas = 10-20 pc – Band 6



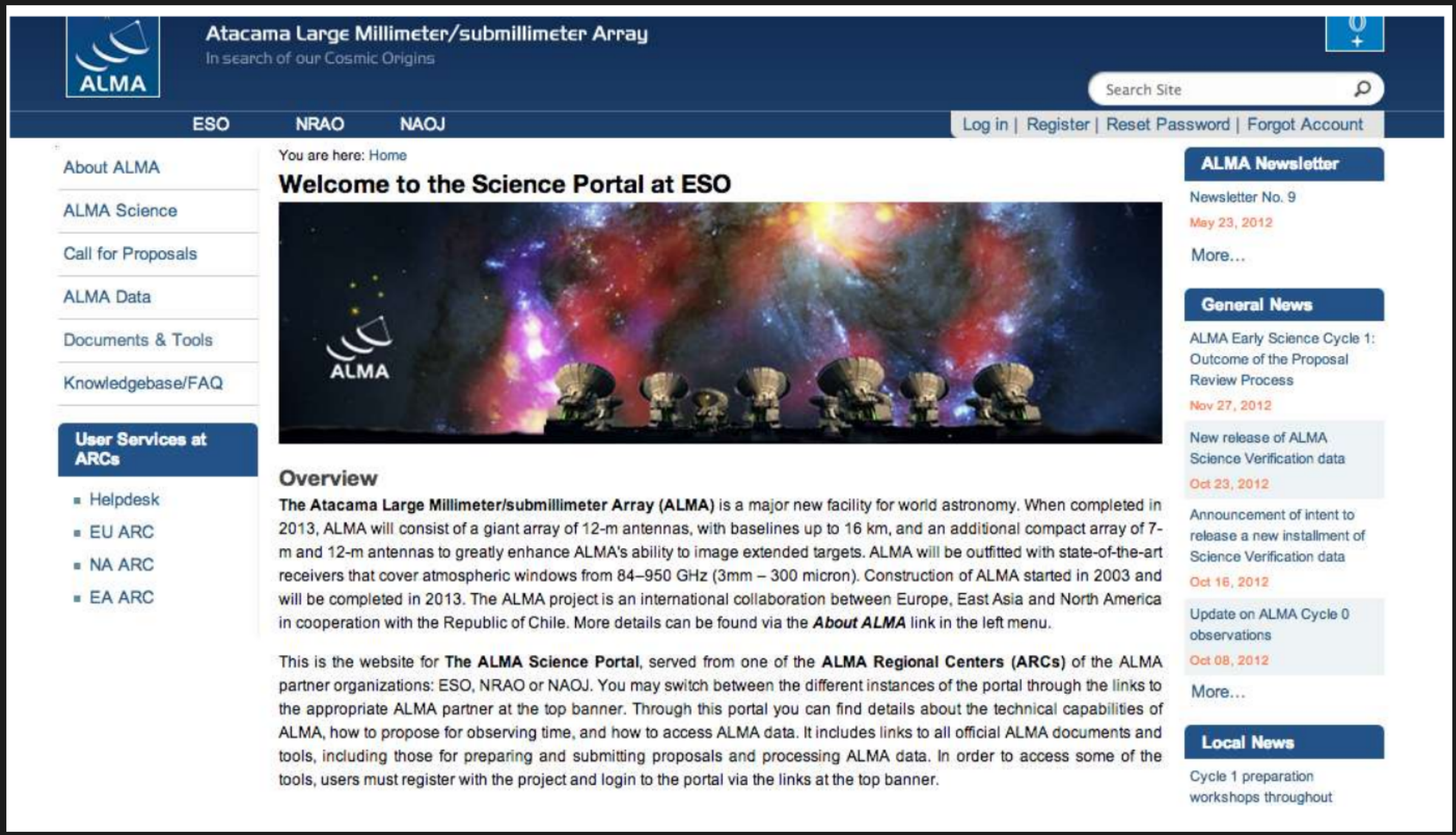
Highlight from ALMA

HL- Tau – Young T-T star
Long Baseline campaign – 30 x 19 mas – Band 3, 6, 7 continuum



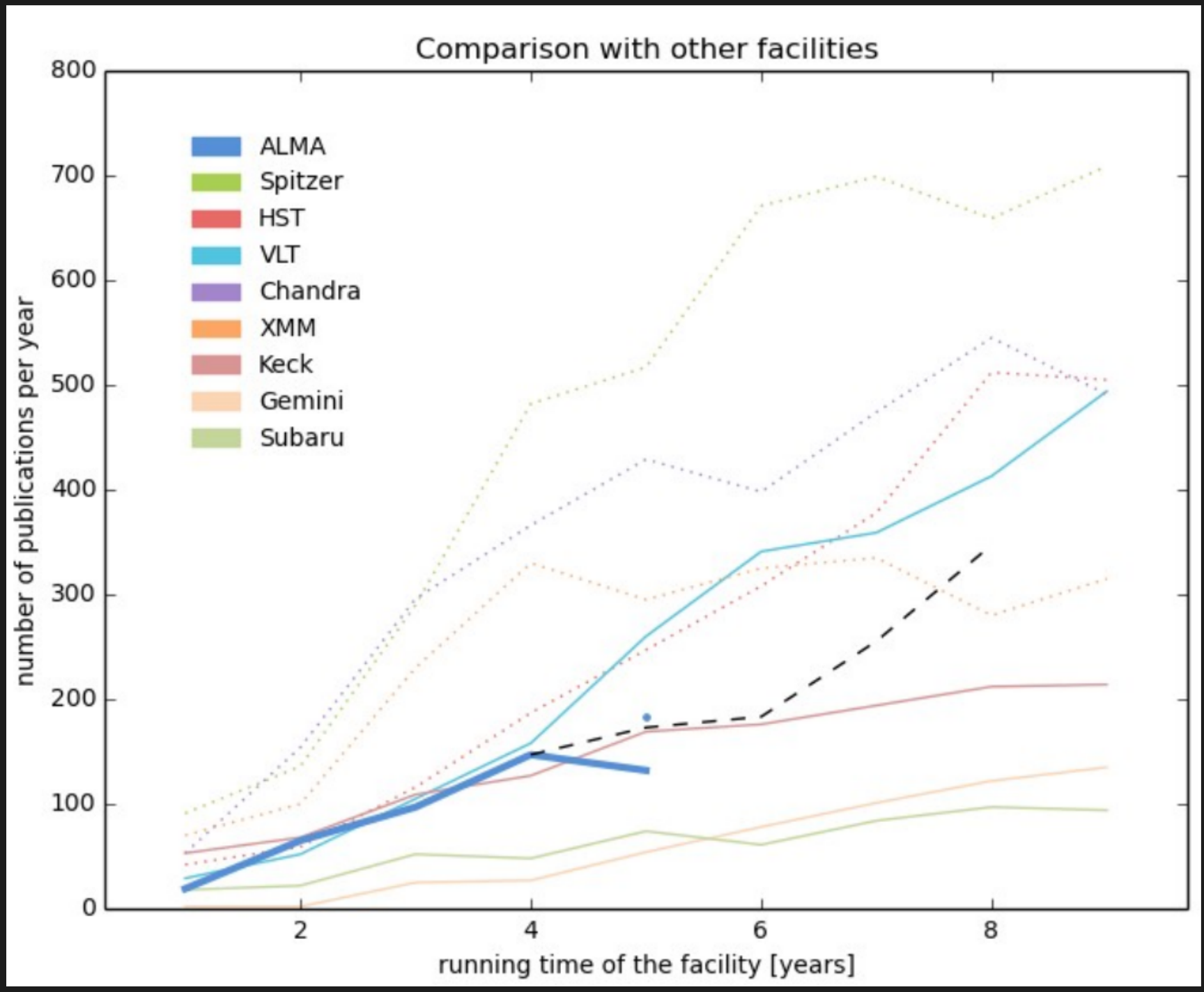
ALMA website

almascience.org



ALMA Archive

The ALMA archive is growing and the more and more scientists are using this huge data set for their investigation.



ALMA Archive

To have a preliminary introduction:

https://almascience.eso.org/alma-data/archive

For the access:

https://almascience.eso.org/aq/

ALMA Archive

ALMA Science Archive Query

Query Form | Results Table

Search | Reset

Query Help

Position

Source name (Resolver)
Source name (ALMA)
SDC335.579-0.292
RA Dec
Angular resolution
Largest angular scale

Energy

Frequency
Bandwidth
Spectral resolution
Band

Time

Observation date
Integration time

Polarisation

Polarisation type

Observation

Water vapour

Project

Project code
Project title
PI name
Project abstract
Publication count

Publication

Authors
Title
Abstract

Options

View:
- (•) raw data
- ( ) project
- ( ) publication

[ ] public data only
[x] science observations only

ALMA Archive

ALMA Science Archive Query

Query Form | Results Table

Submit download request

Results Bookmark | Export Table | Results Help

Showing 3 of 3 rows. More columns

	Project code	Source name	RA	Dec	Band	Integration	*Release date* ▲	Velocity resolution	Frequency support	Pub
Filter:								m/s		
	2011.0.00474.S	SDC335.579-0.292	16:30:56.48	-48:43:36.4	3	1938.178	2014-03-01	184.58	90.62..105.14GHz	1
	2016.1.00810.S	SDC335.579-0.292	16:30:59.21	-48:43:48.1	3	4838.4	In Progress	2774.69	90.61..106.01GHz	0
	2016.1.00810.S	SDC335.579-0.292	16:30:59.21	-48:43:48.1	3	12413.808	In Progress	2774.70	90.61..106.01GHz	0

ALMA Schedule

Mid-March: Call for Proposals

Mid-April: deadline

August: Proposal Review

September: Submission Phase 2

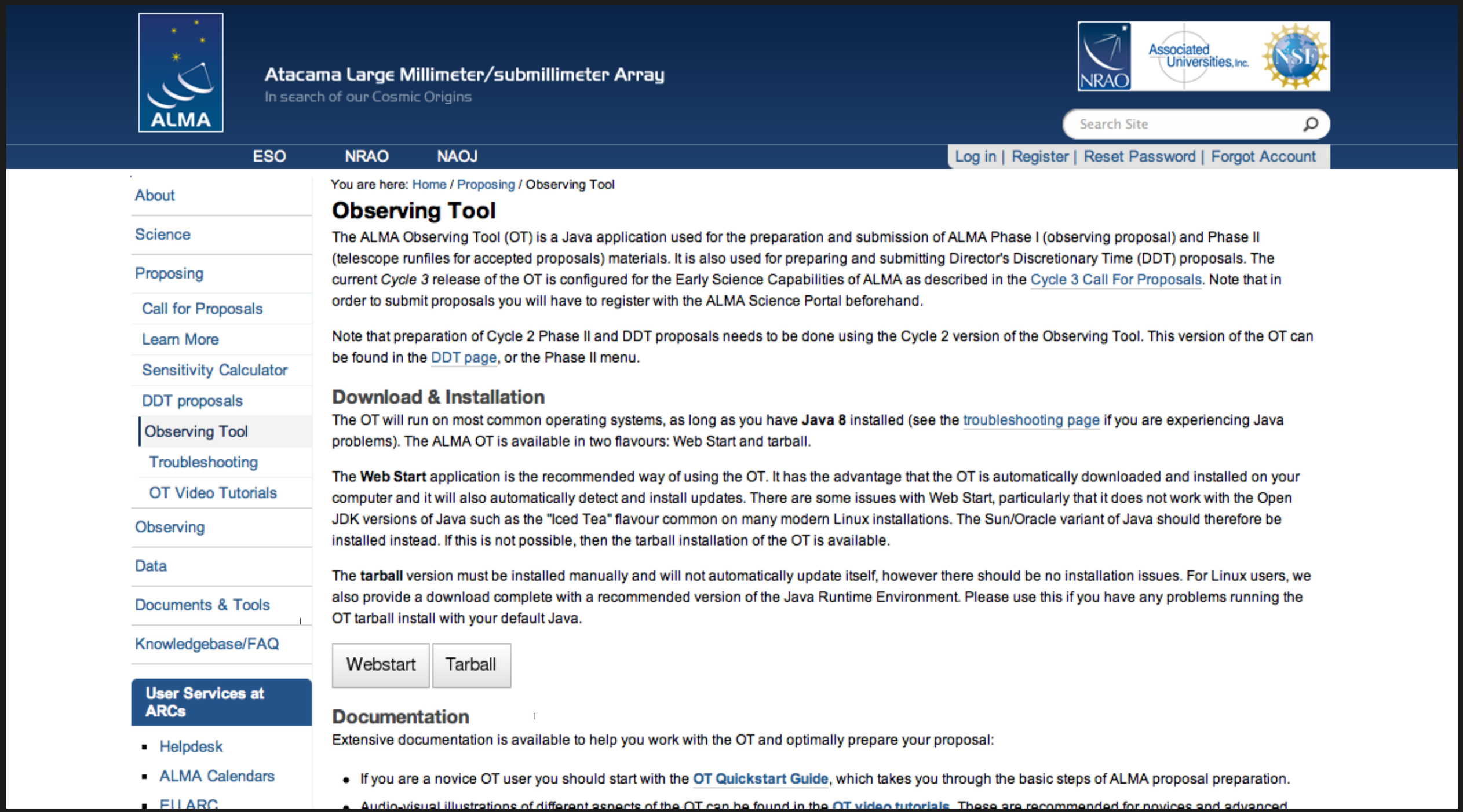
End of September: End of the observations for the previous cycle

October: New Cycle

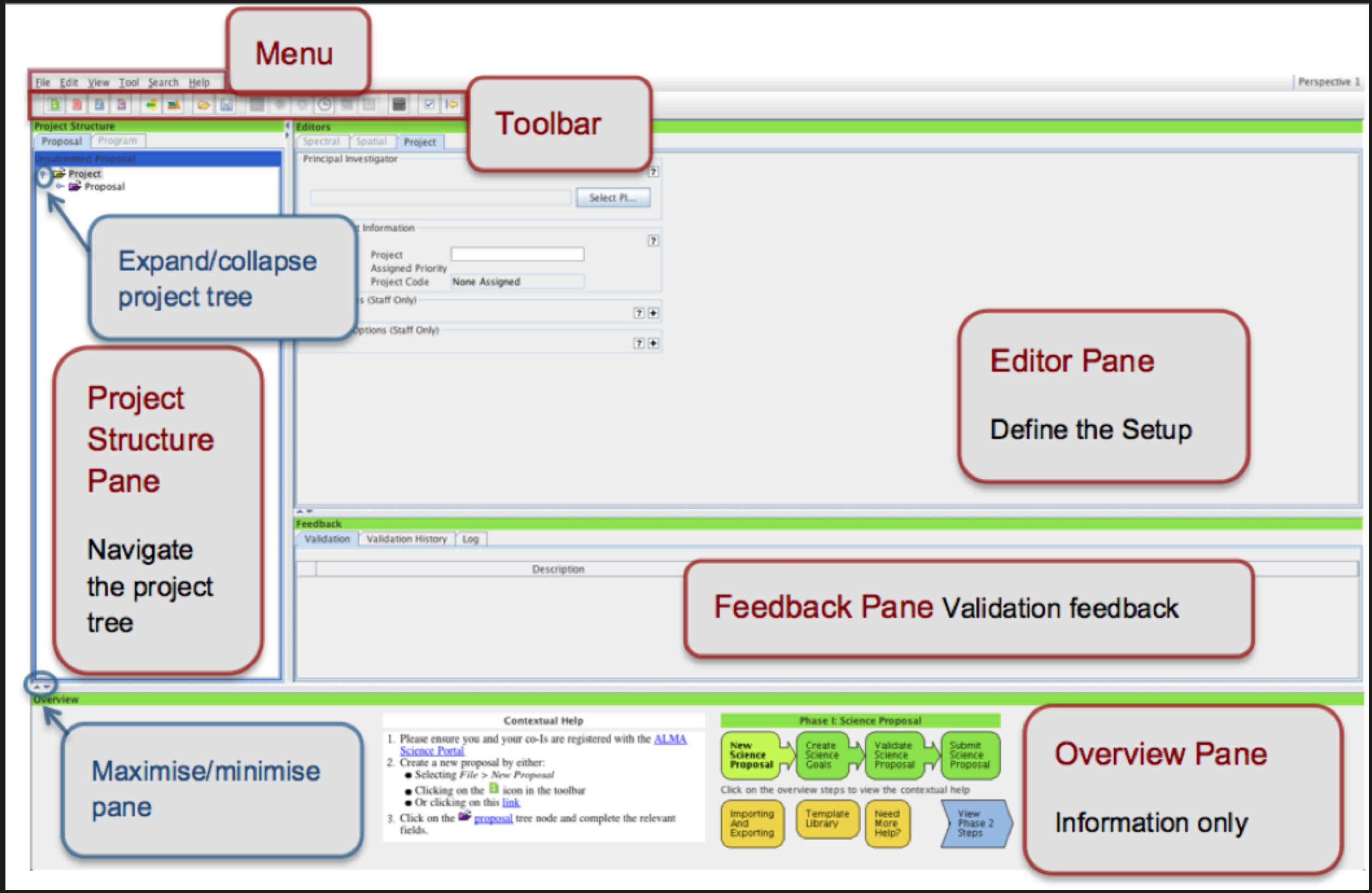
NB = All the proposals must be submitted electronically using the ALMA Observing Tool software (AOT)

Download ALMA AOT

Two flavours: webstart and tarball. Warmly suggested to use webstart

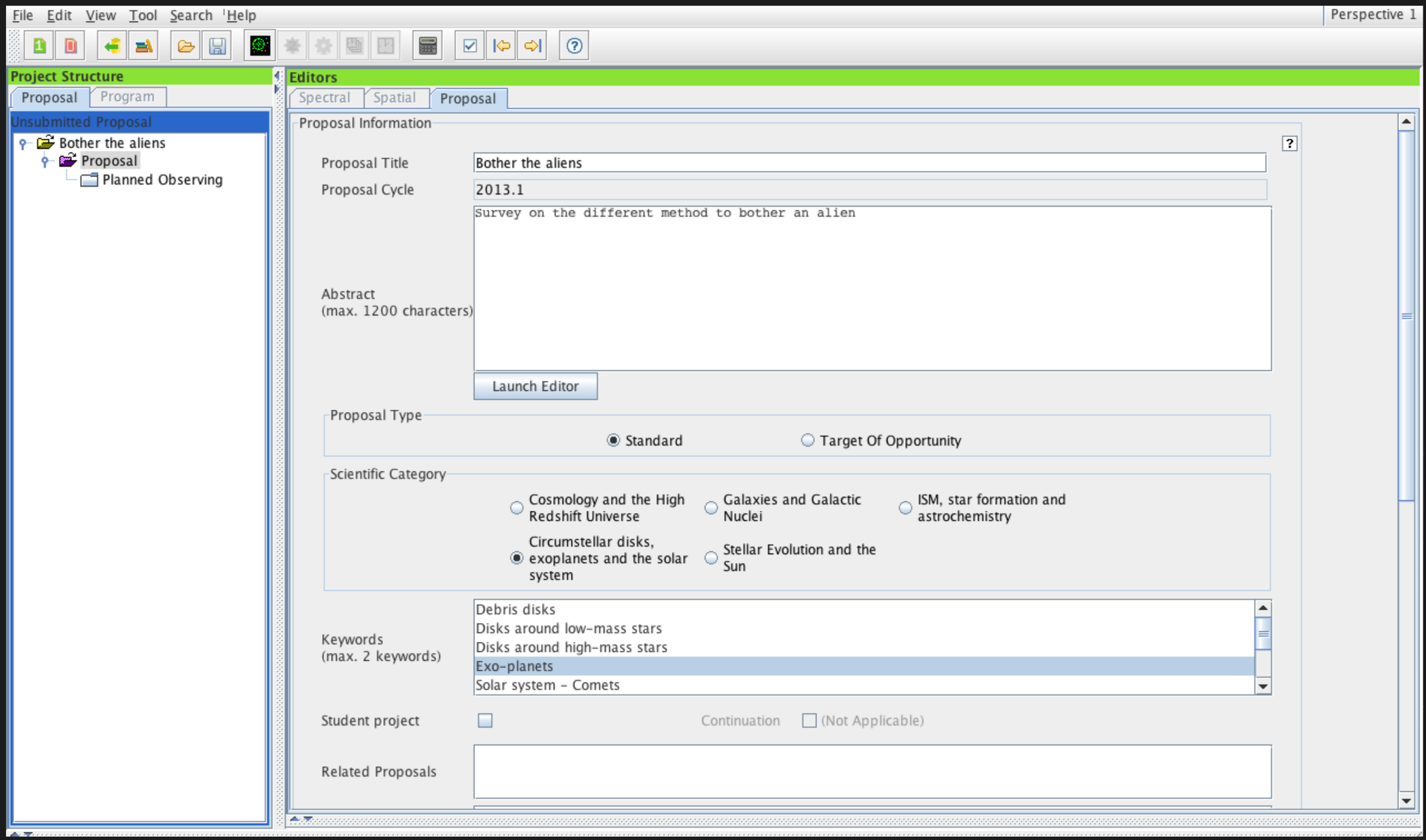


ALMA AOT


Menu
Toolbar
File Edit View Tool Search Help
Perspective 1
Project Structure
Proposal Program
Unsubmitted Proposal
Project
Proposal
Editors
Spectral Spatial Project
Principal Investigator
Select PI...
Information
Project
Assigned Priority
Project Code
None Assigned
(Staff Only)
Options (Staff Only)
Expand/collapse project tree
Editor Pane
Define the Setup
Project Structure Pane
Navigate the project tree
Feedback
Validation Validation History Log
Description
Feedback Pane Validation feedback
Overview
Maximise/minimise pane
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
Overview Pane
Information only

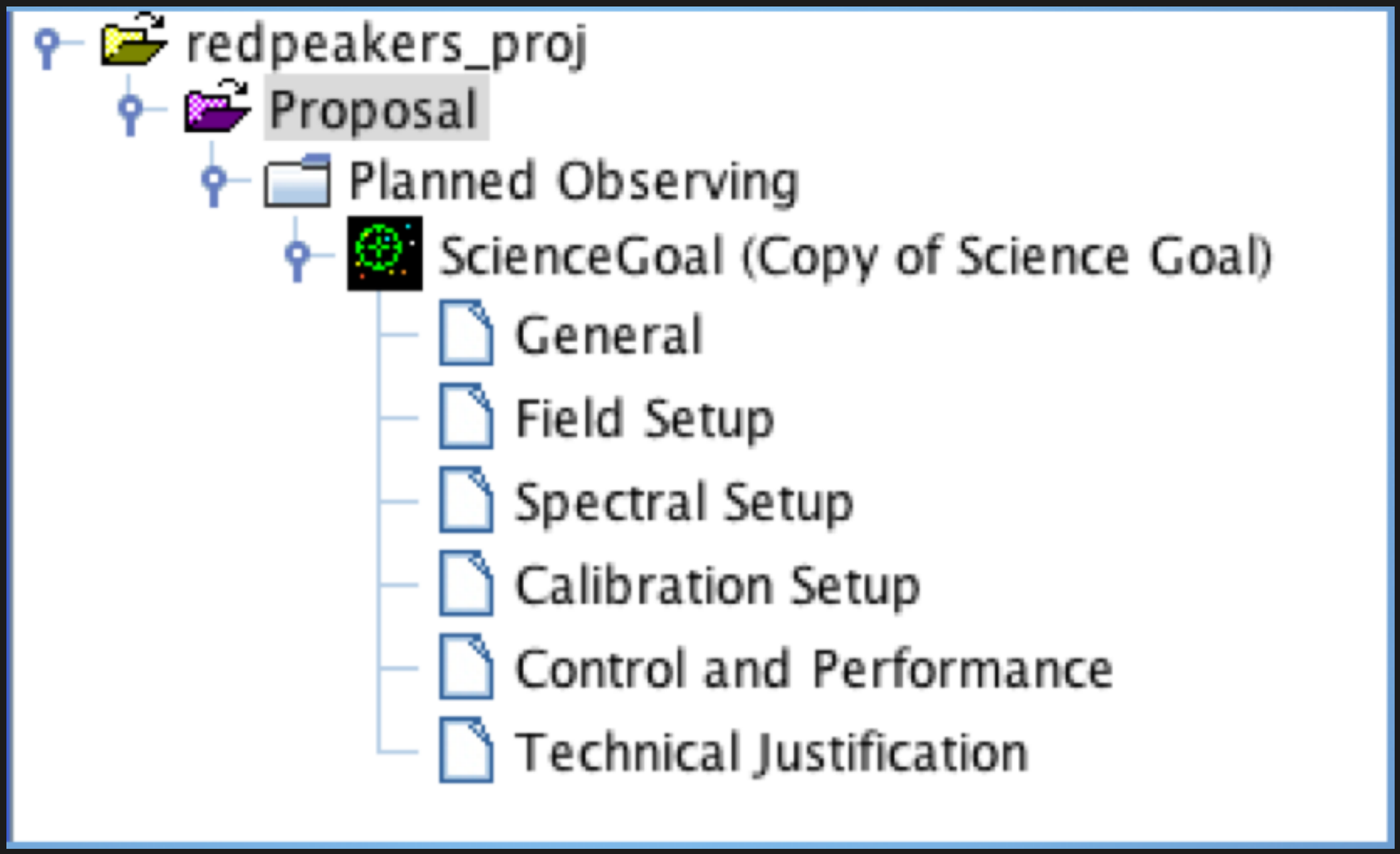
ALMA AOT

Start: Project PI and add a science goal



ALMA AOT

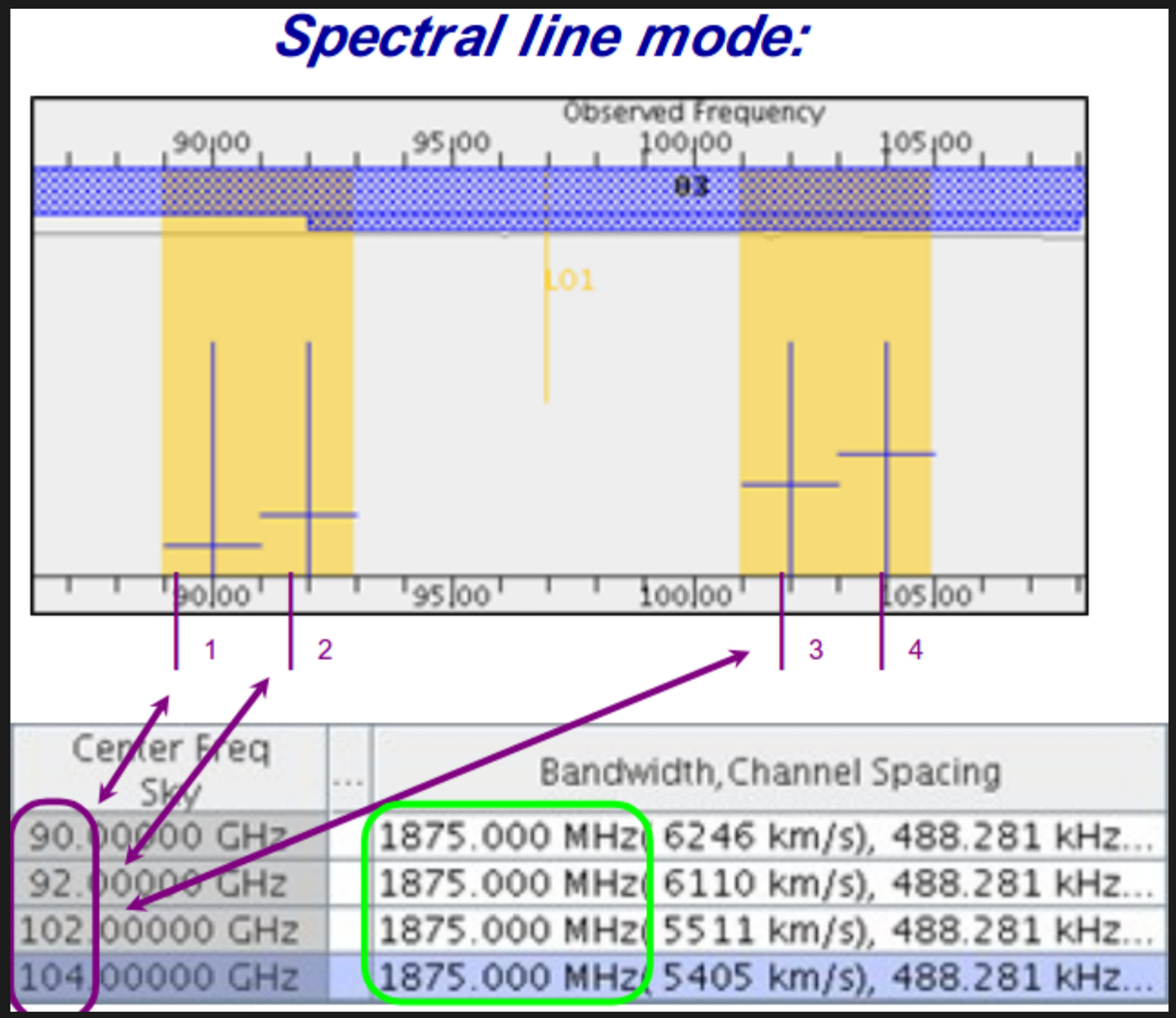
A Science goal contains all the necessary fields to perform an observations



ALMA Spectral Setup

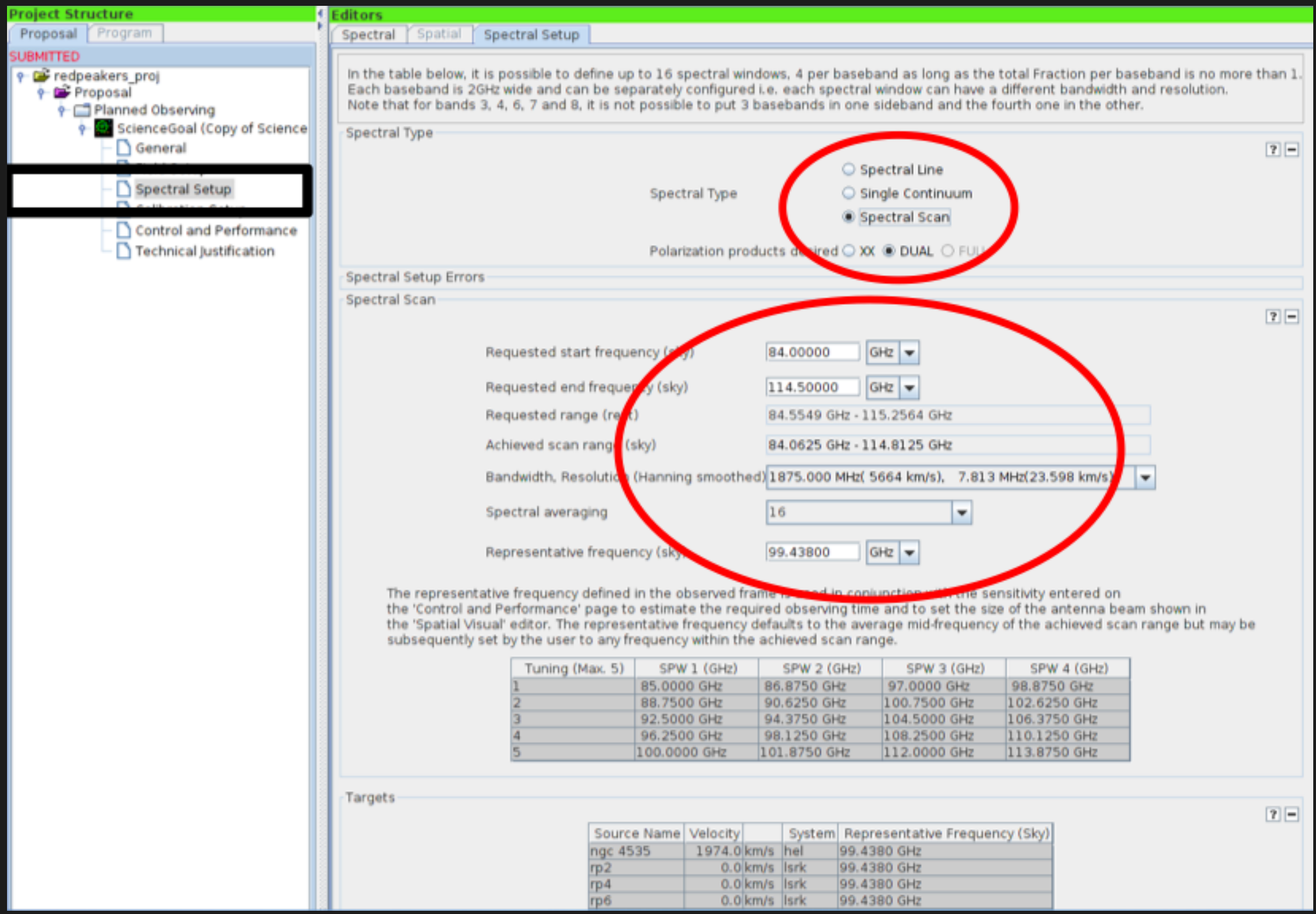
The PI defines the spectral setup according to the specifications of the ALMA receiver:

Once defined the frequency range to observe up to four 2GHz wise Basebands can be placed. Within each Basebands it is possible to place up to 4 spectral windows, with bandwidth from 59.59 MHz up to 1.875 GHz



ALMA AOT

In spectral setup the PI put details about the band and the resolution.



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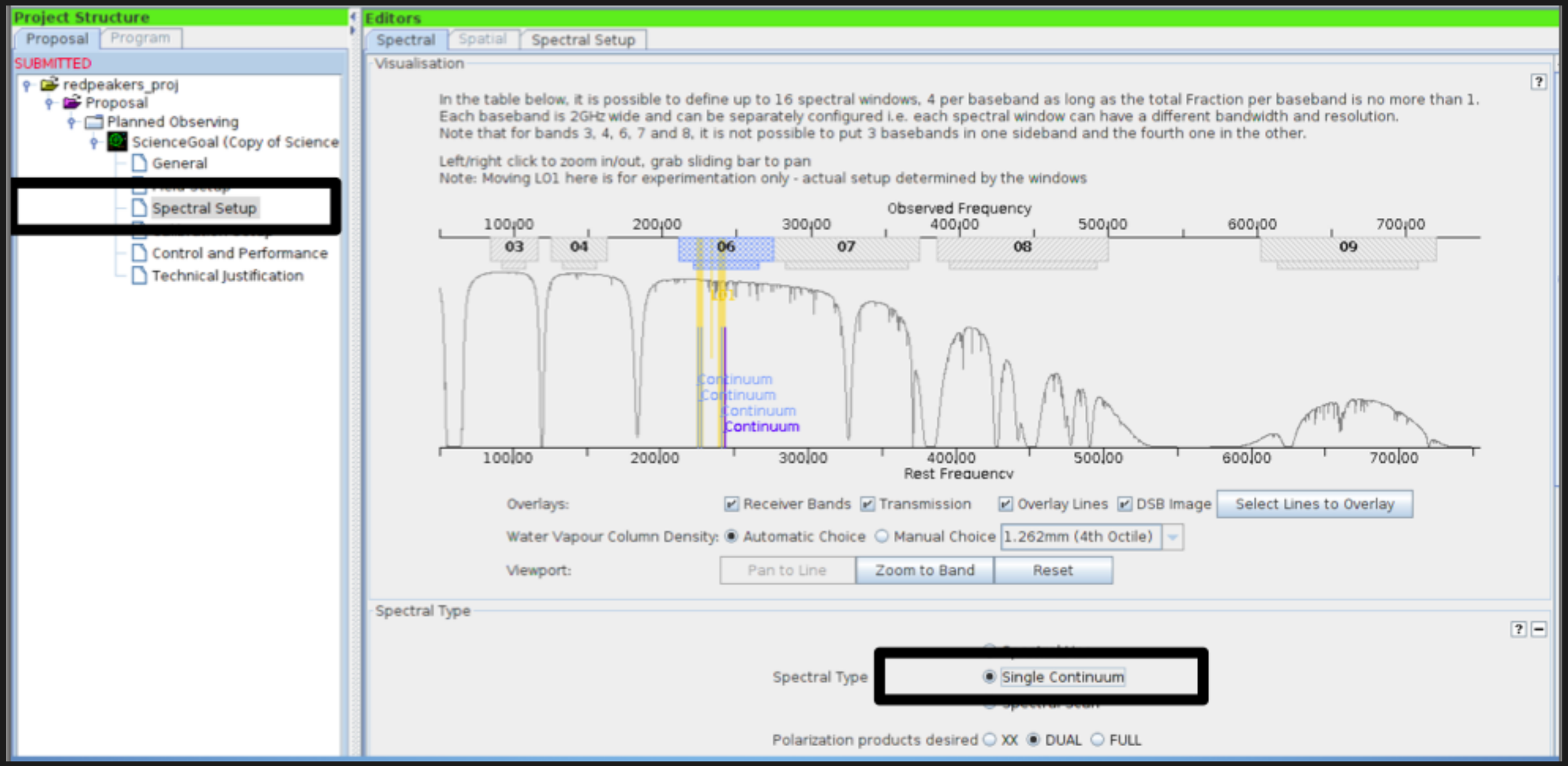

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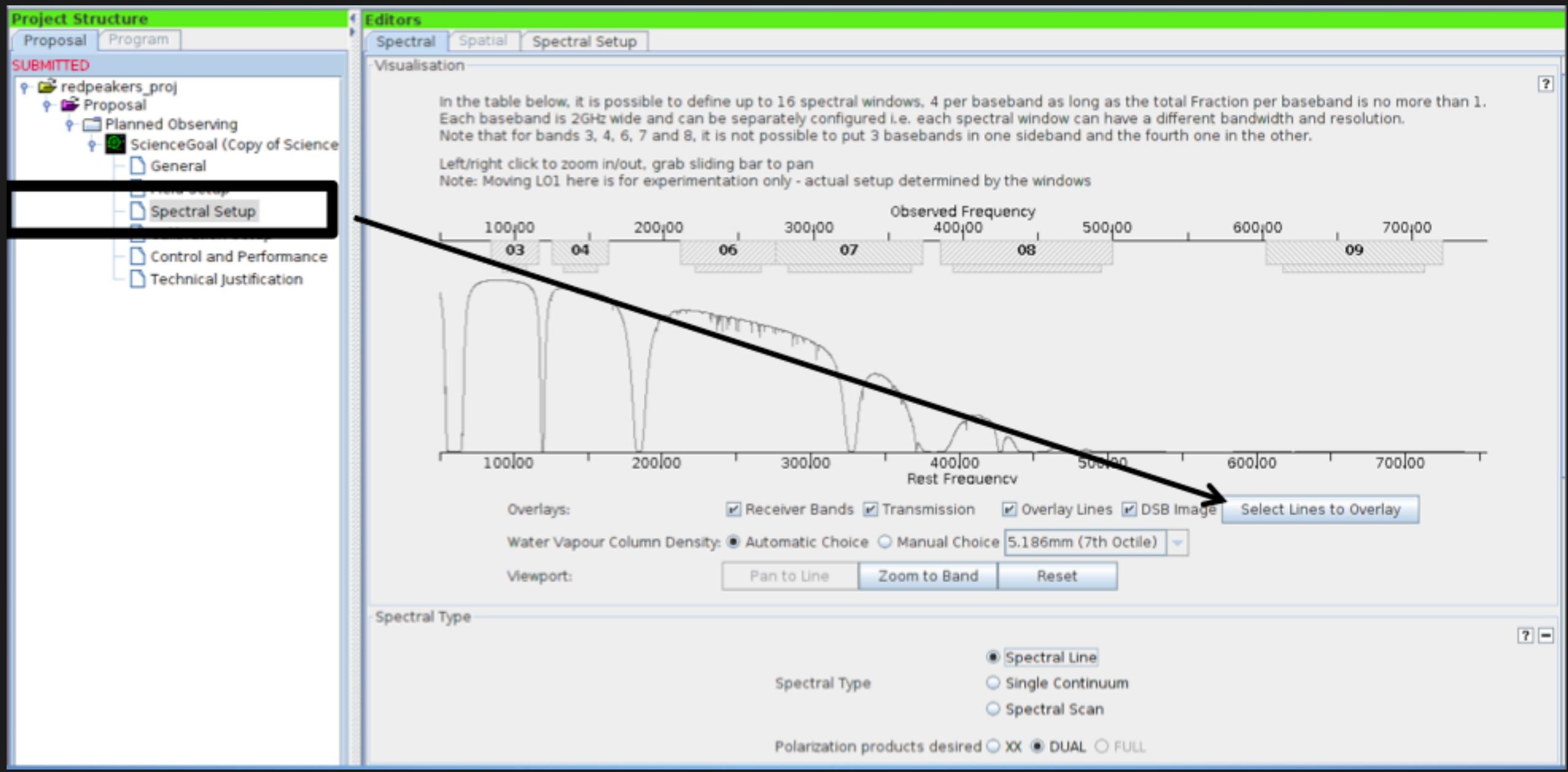

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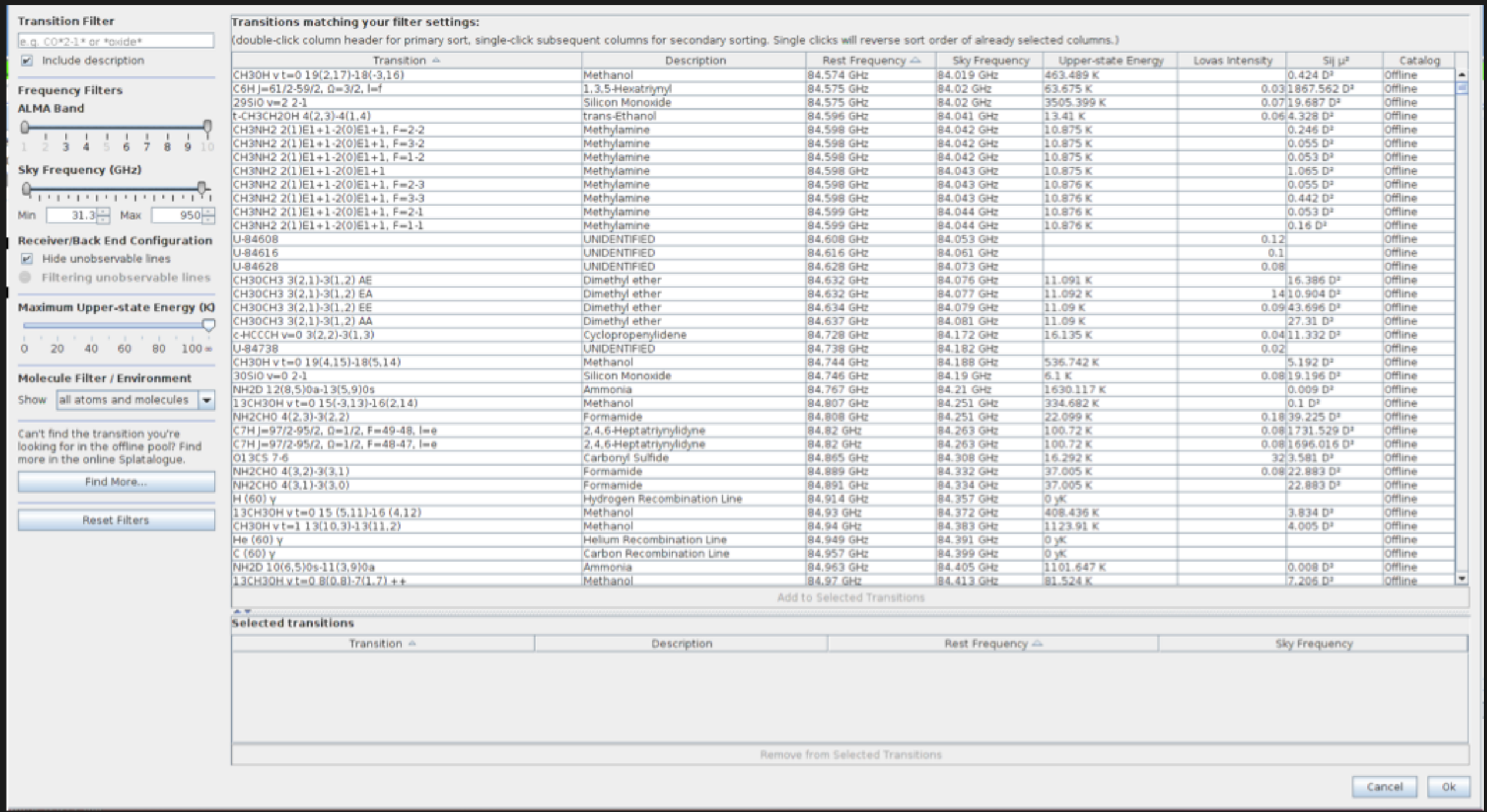

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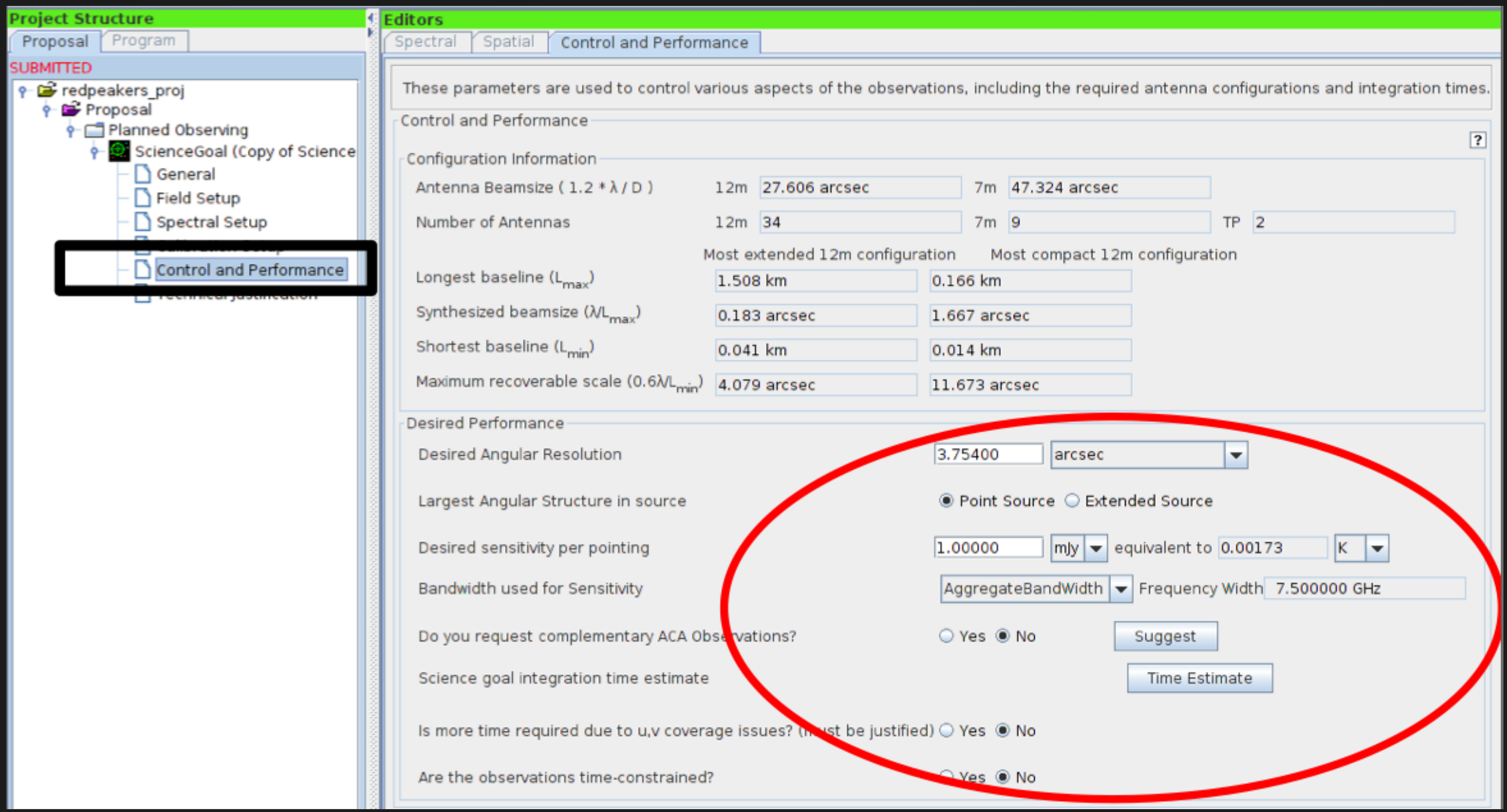

ALMA Product

ALMA delivers data cubes, of which the third axis is frequency. In this sense, the final data products are very much like that of an integral field unit with up to a million Spectral Pixels.