

ALMA Observing Tools

Italian ALMA Regional Center
INAF-Istituto di Radioastronomia (Bologna)

Tutorials , April-May 2011



EUROPEAN ARC
ALMA Regional Centre || Italian

◆ INAF

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DI ASTROFISICA
NATIONAL INSTITUTE
FOR ASTROPHYSICS

ALMA basics

ALMA Early Science

Hints to use the ALMA tools

Support for ALMA users



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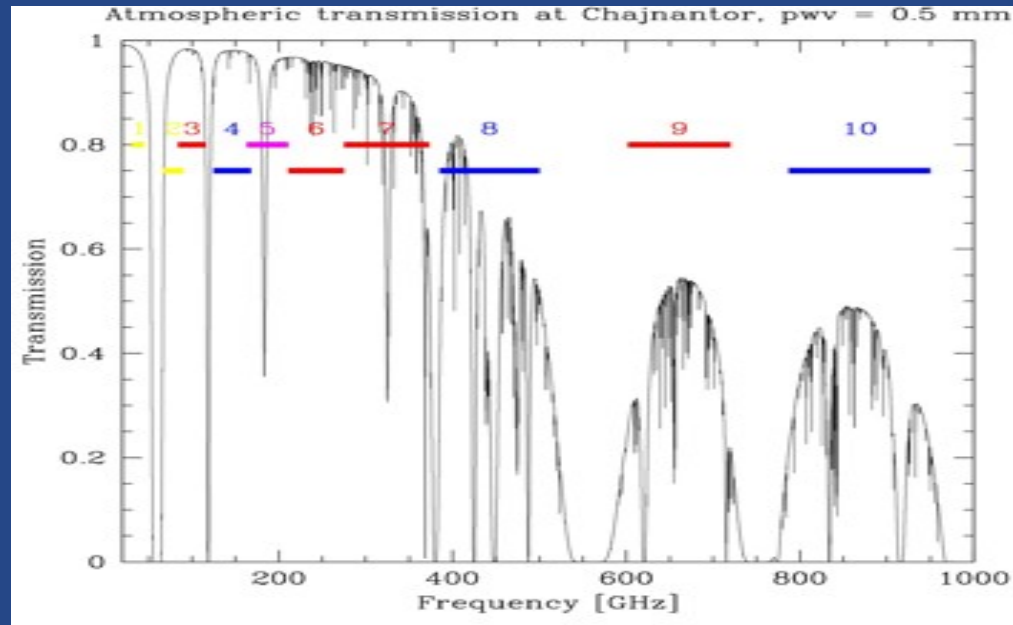
ALMA overview and Early Science



ALMA numbers

- The Atacama Large Millimeter Array is a **mm-submm reconfigurable interferometer**
- Under construction on the Chajnantor plain (**5000m**, Chile)
- Frequency range: **10 bands between 30-900 GHz** (0.3-10 mm)
- Antennas: **50x12m** main array + **(12x7m + 4x12m) ACA**

- **World wide collaboration:**
Europe: ESO (14 countries),
North America: NRAO (USA, Canada),
East Asia: NAOJ (Japan, Taiwan),
Chile
- Contributors share the observing time

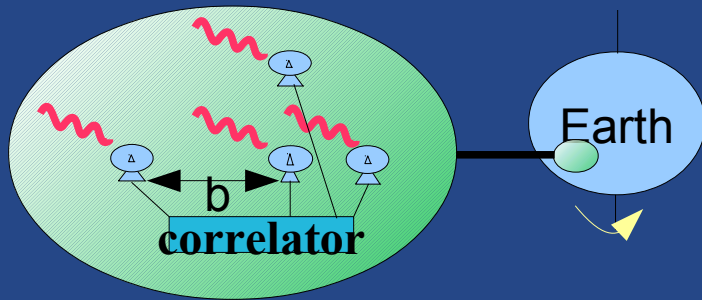


ALMA numbers

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- Located on the Chajnantor plain (**5000m**, Chile)
- Frequency range: **10 bands between 30-900 GHz** (0.3-10 mm)
- Antennas: **50x12m** main array + **(12x7m + 4x12m) ACA**
- Baselines length: **15m ->150m-16km** + **9m->50m**
- Bandwidth: **2 GHz x 4basebands for each of 2 polarisations**
- **70 correlator modes**: 31MHz-2GHz / 8192 ch / single, dual, full polarisation product
- **Mosaic** capability



Interferometry in a nutshell



An interferometer **reconstructs an image of the sky at fixed spatial scales** (i.e. measures single points in the Fourier domain) corresponding to the projection of the baselines on the sky.

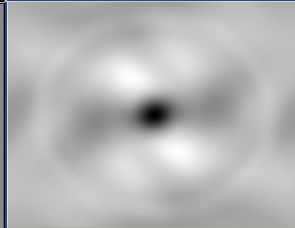
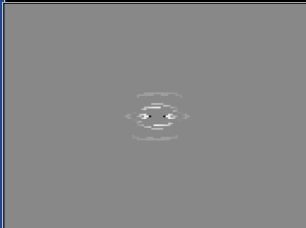
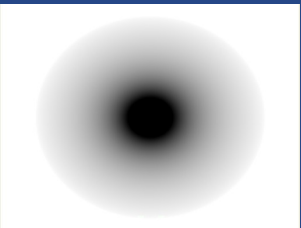
Imaging quality depends on the Fourier space coverage,

i.e. on the number of baselines ($N(N-1)/2$).

Resolution depends on the baseline length.

Sensitivity depends on effective collecting area, integration time, bandwidth.

Water vapour effects get worse as the frequency increases



Object

Fourier space

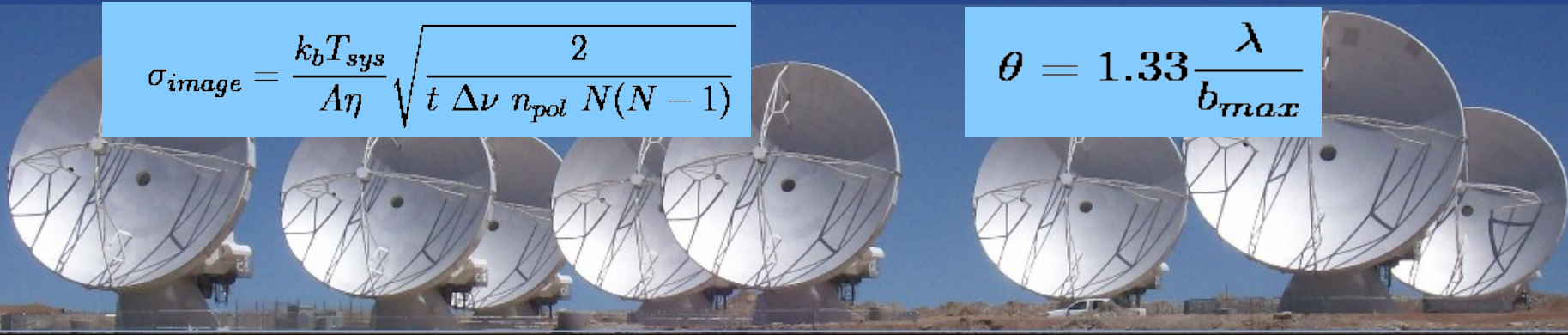
Image space

Noise in the image

$$\sigma_{image} = \frac{k_b T_{sys}}{A \eta} \sqrt{\frac{2}{t \Delta \nu n_{pol} N(N-1)}}$$

Angular resolution

$$\theta = 1.33 \frac{\lambda}{b_{max}}$$



ALMA numbers

Dry site, low pwv, low T_{sys} , high sensitivity also at submm frequencies

>6500sqm of effective area and 1225 baselines for the 12m array
+ Short spacings with ACA

Excellent instantaneous uv coverage & high sensitivity
<0.05mJy @100 GHz in 1 hr

Up to 16km baselines, subarcsec resolution
 $0.2'' \times (300/\text{freq_GHz}) \times (1\text{km}/\text{max_baseline})$
40 mas @ 100 GHz,
5 mas @ 900 GHz
FOV 12m array: $20.3''/(300/\text{freq_GHz})$

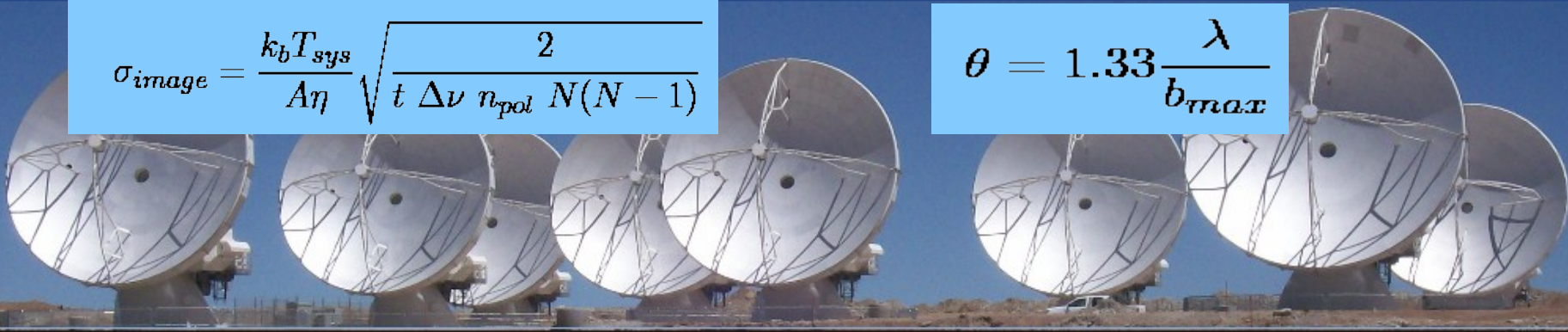
Flexibility in spectral and spatial studies

Noise in the image

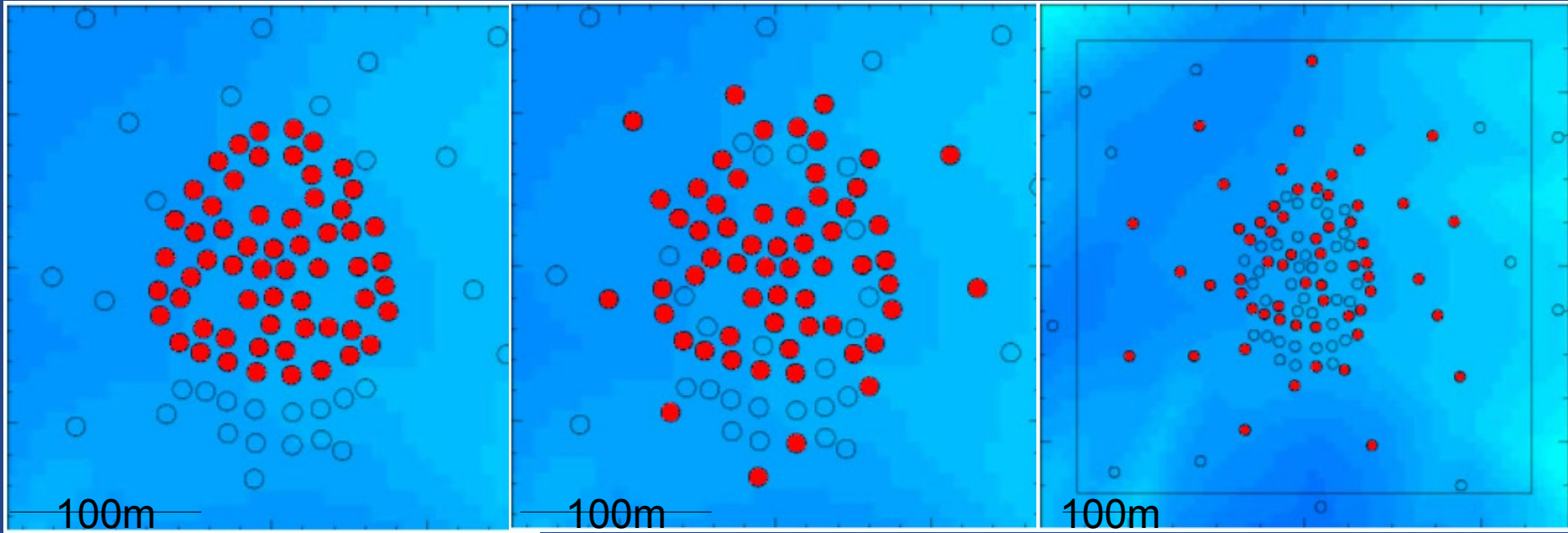
$$\sigma_{\text{image}} = \frac{k_b T_{\text{sys}}}{A \eta} \sqrt{\frac{2}{t \Delta \nu n_{\text{pol}} N(N-1)}}$$

Angular resolution

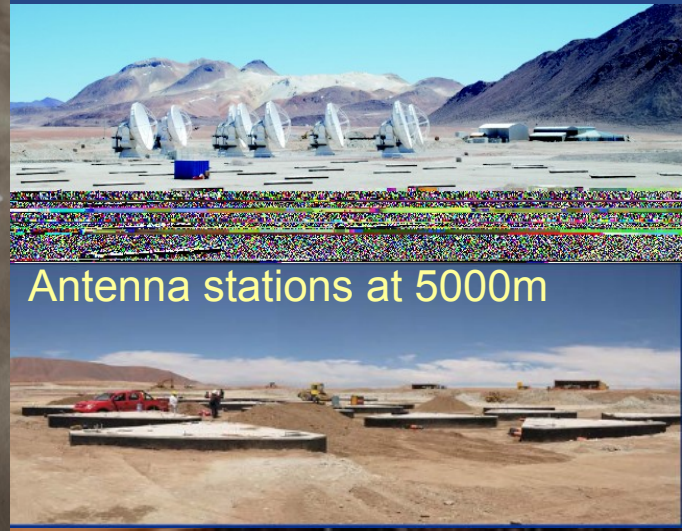
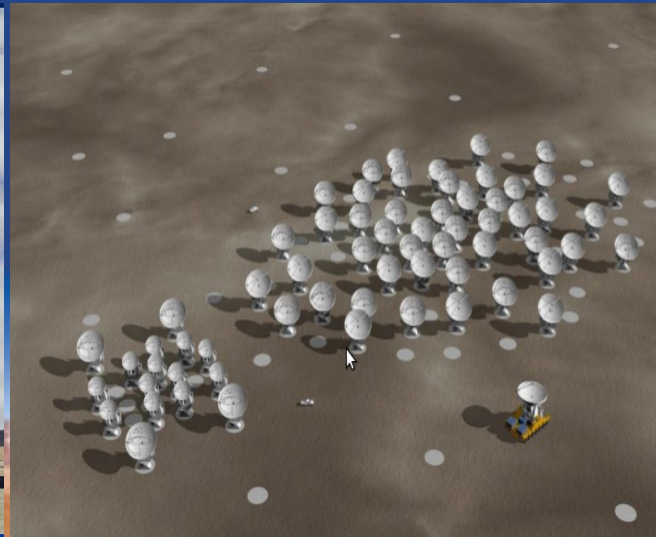
$$\theta = 1.33 \frac{\lambda}{b_{\text{max}}}$$



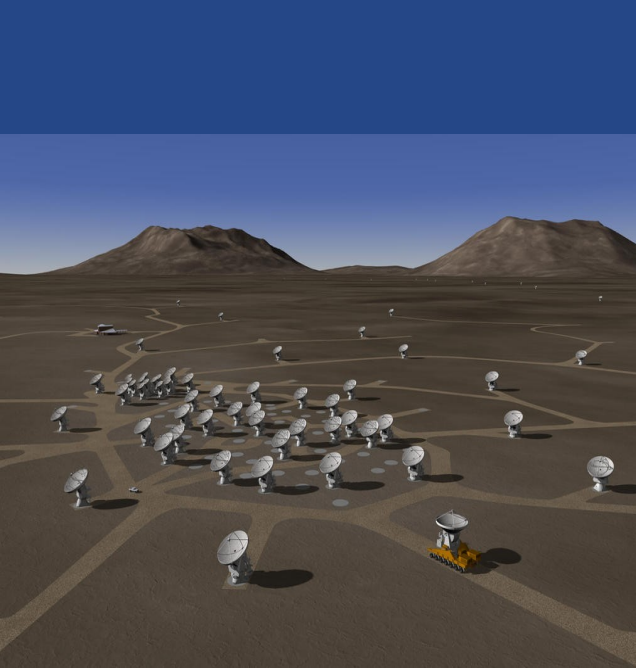
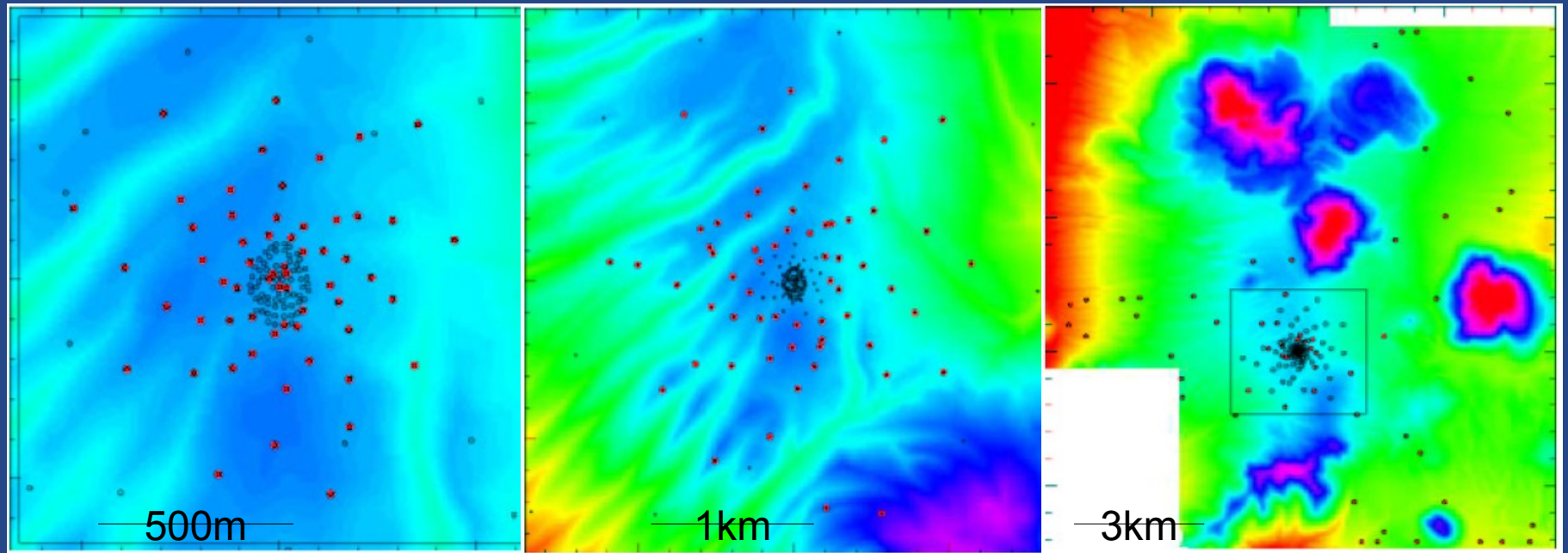
ALMA reconfiguration



Antenna transporter



ALMA reconfiguration

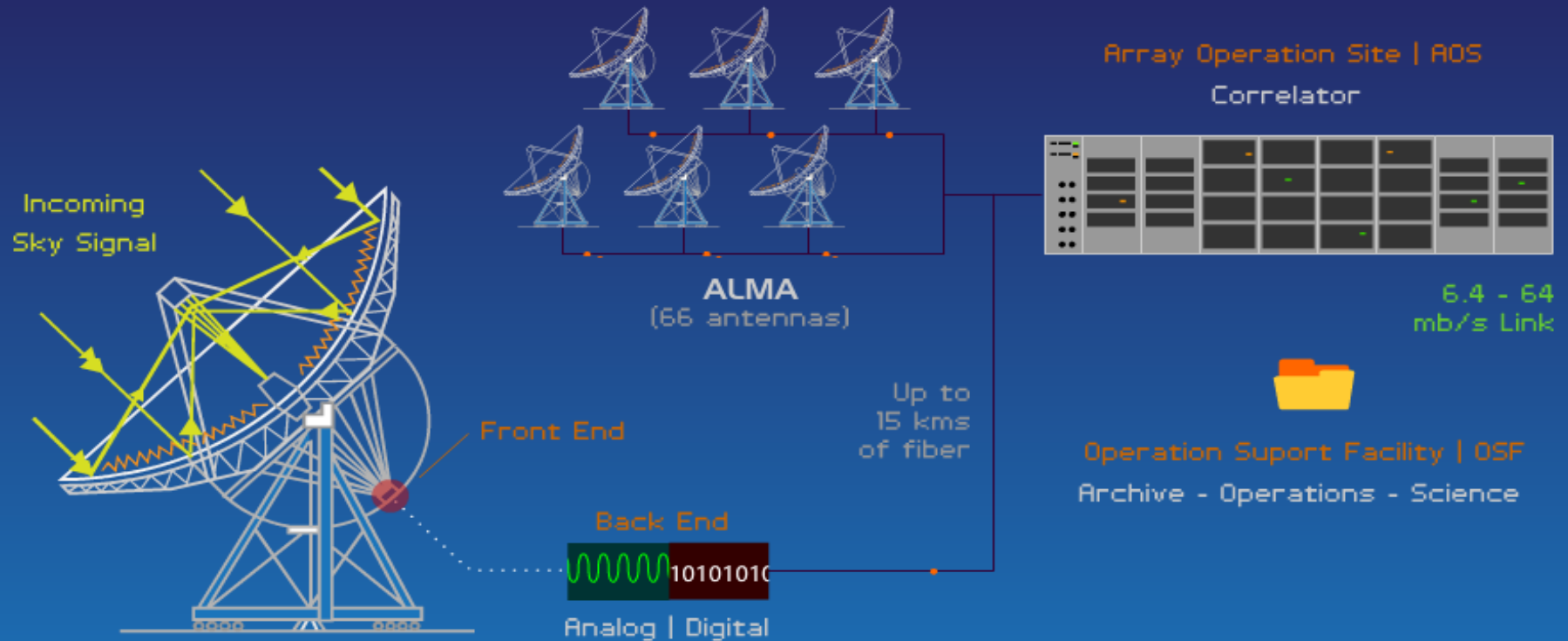


ALMA organization

- 3 sites in Chile
 - AOS: ALMA operations site (5000 m)
 - Antennas, correlator
 - OSF: Operations support facility (3000 m)
 - Labs, antenna assembly and maintenance
 - Operators, astronomers
 - SCO: Santiago central office
 - JAO (Joint ALMA observatory)
 - » Calls for proposals
 - » Running ALMA
 - » Data reduction pipeline
 - » Quality assessment
 - Archive
- ALMA Regional Centers



ALMA data flow



ALMA receivers

Heterodyne Receiver sensitive to Upper and Lower Side Bands (USB and LSB). Sidebands are mapped to a lower frequency band by mixing the sky signal with a **Local Oscillator (LO)**. Varying LO1 changes the sidebands position.



ALMA receivers are

- 2SB (separated in the receiver):

 - Bands 3, 4, 5, 7, 8 sidebands 4 GHz wide separated by 8 GHz

 - Band 6

 - sidebands 5 GHz wide separated by 10 GHz

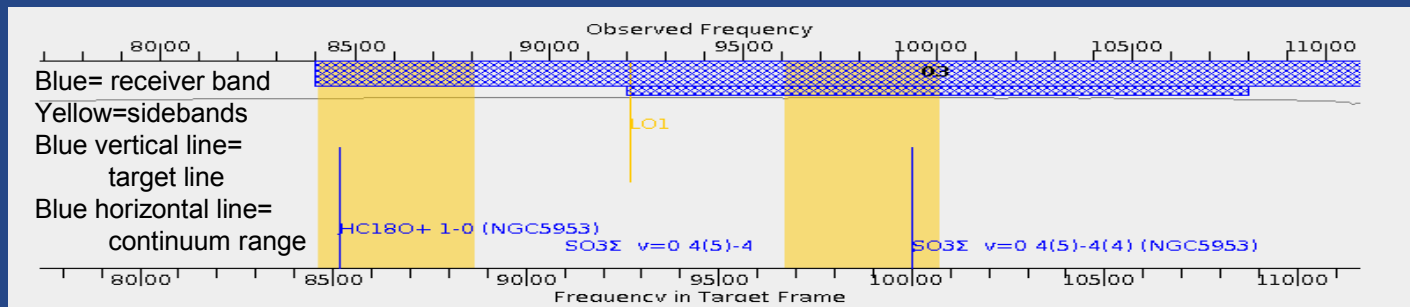
- DSB (separated in the correlator):

 - Bands 9, 10

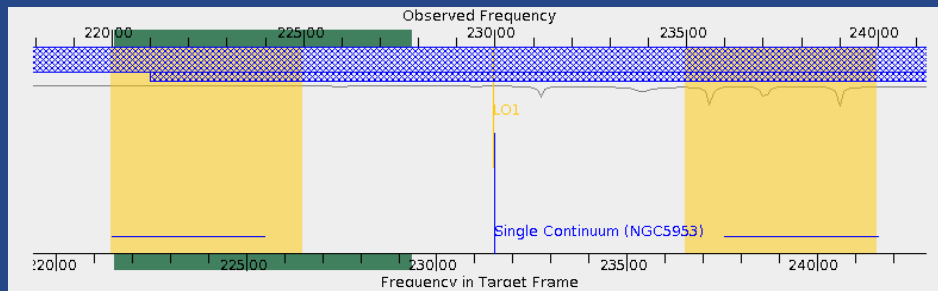
 - sidebands 8 GHz wide separated by 8 GHz



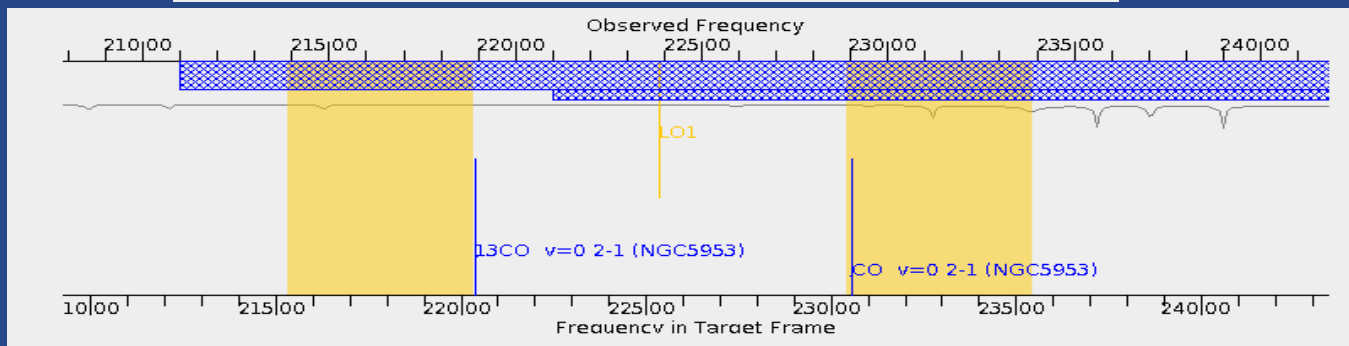
ALMA frequency setup



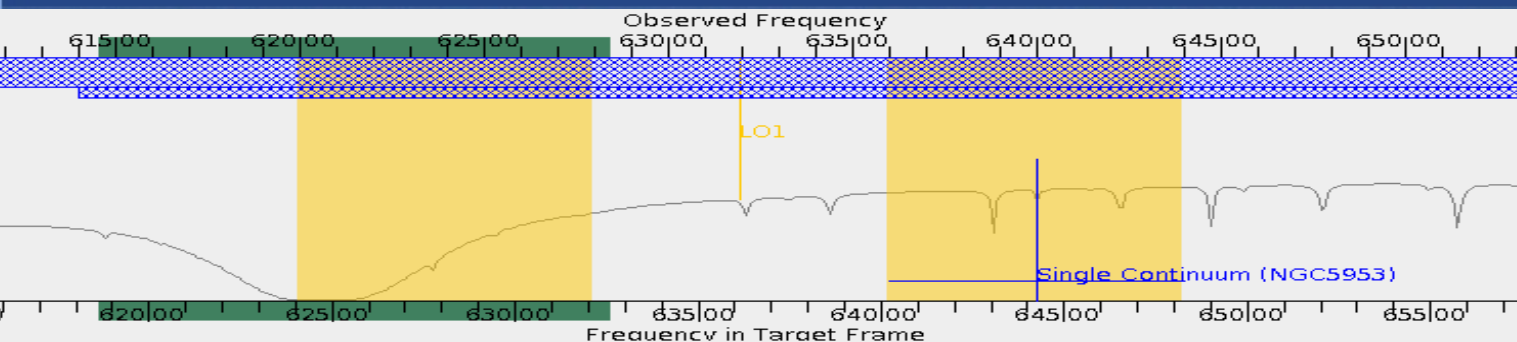
Band 3:
2 sidebands to
see target lines



Band 6:
2 sidebands for
2SB continuum



Band 6:
5-10GHz
separation
allows 13CO
and 12CO

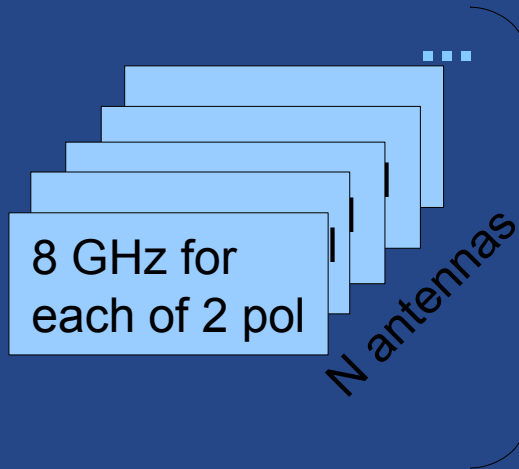


Band 9:
DSB continuum



ALMA correlator

INPUT from
front ends



The 4 basebands can be
setup independently
Highly flexible correlator:
>70 modes

CORRELATOR split
in 4 quadrants

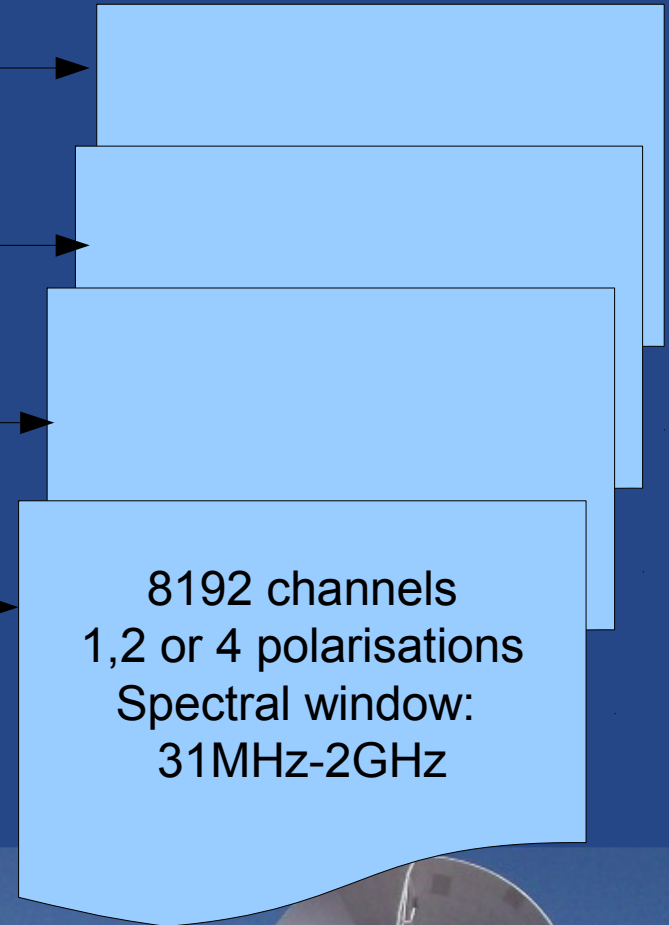
1quadrant=
1baseband=
2GHz

1quadrant=
1baseband
=2GHz

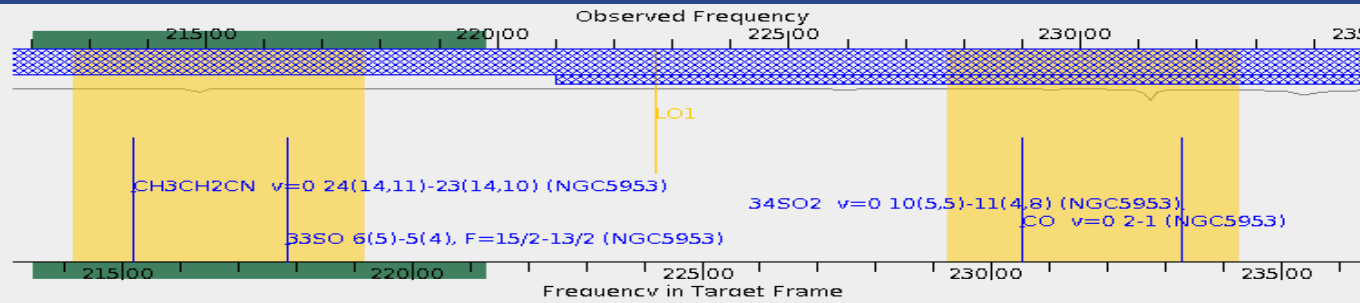
1quadrant=
1baseband
=2GHz

1quadrant=
1baseband
=2GHz

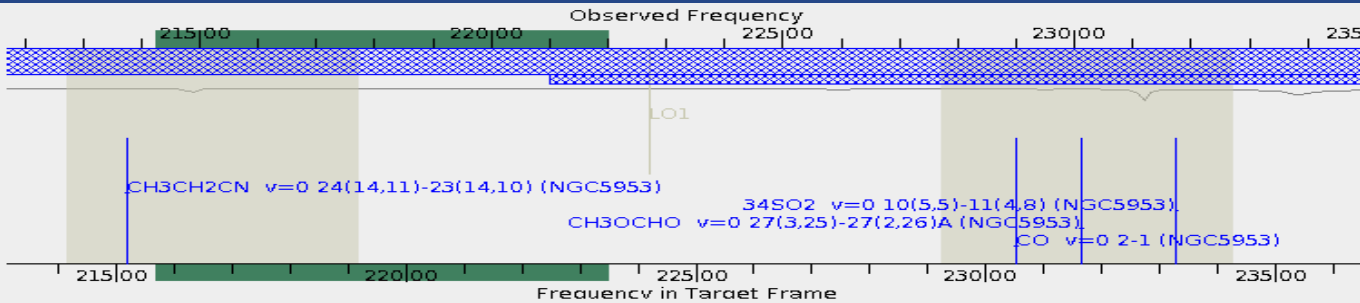
OUTPUT from each
baseband



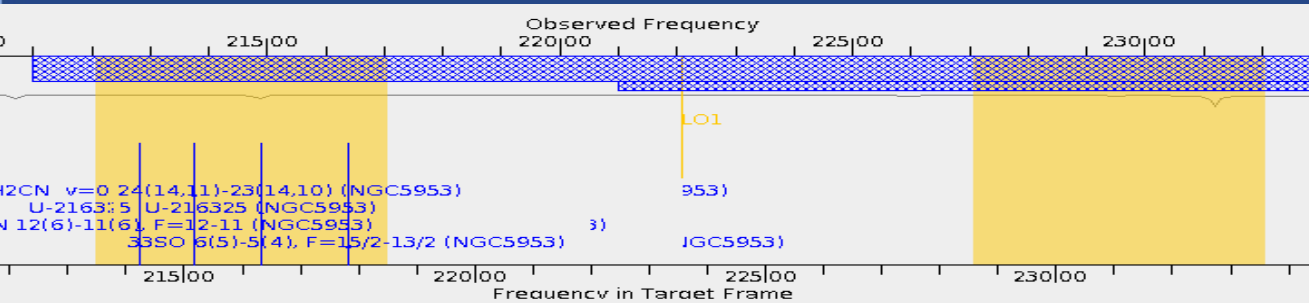
ALMA spectral windows setup



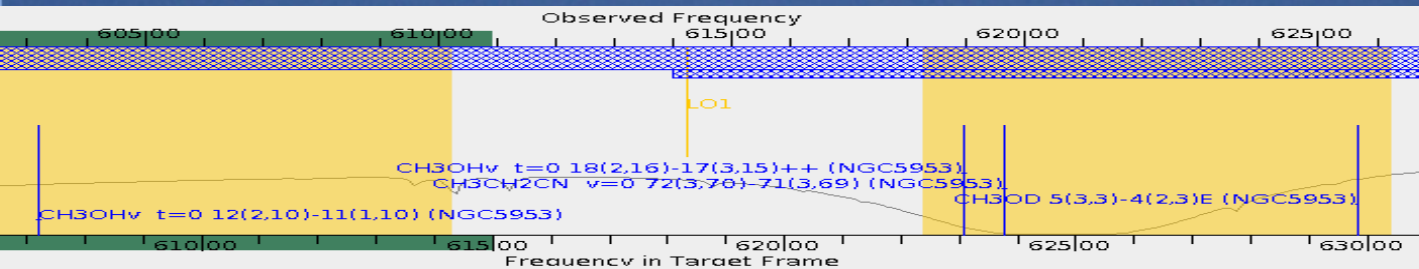
2SB:
2 basebands per
sideband



2SB:
3 basebands per
sideband
NOT ALLOWED



2SB:
4 basebands per
sideband



DSB:
3 basebands per
sideband
ALLOWED

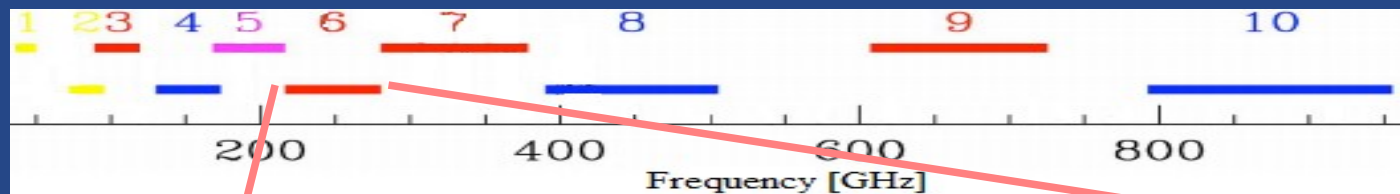


ALMA frequency settings summary

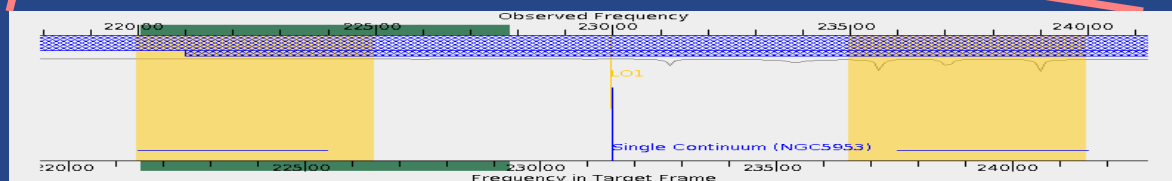
RECEIVERS

CORRELATOR

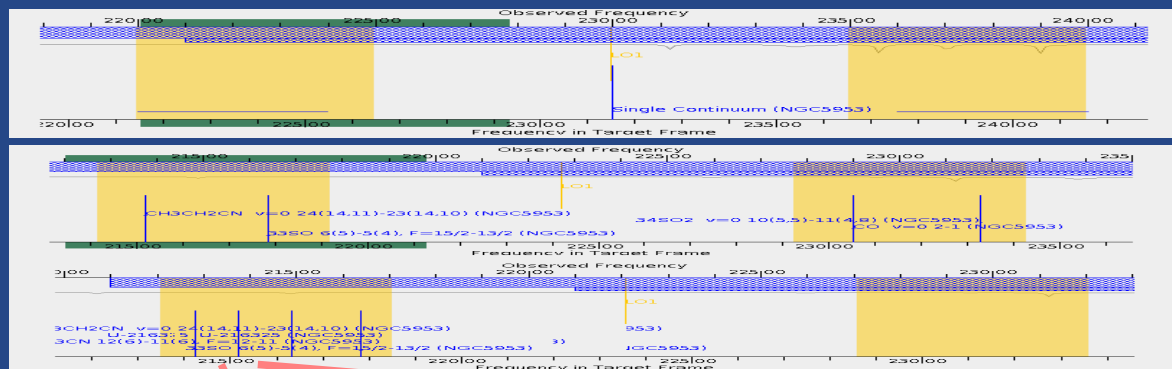
Select the band
(i.e. choose the receiver)



Fix LO1 to define the 2 sidebands



Fix LO2 to define the 4 basebands



Chose your polarisation and
spectral resolution within each baseband

1 pol: up to 8192 channels (=resolution elements)
2 pol: up to 4096 channels
Full stokes: up to 2048 channels



ALMA correlator modes

Two kinds of operation

★ Time Division Mode (TMD)

Pseudo-continuum/wide spectral line

SPW always 2-GHz wide with 64-256 channels

★ Frequency Division Mode (FMD)

High-resolution spectral line

SPW can be 58.6-1875 MHz wide with up to 8192 channels

Correlator Modes for Early Science Cycle 0, dual Polarization

Pseudo-Continuum (2 GHz)	128 channels	15.6 MHz resolution	TDM
1875 MHz	3840 channels x Pol	488 kHz resolution	FMD
938 MHz	3840 channels x Pol	244 kHz resolution	
469 MHz	3840 channels x Pol	122 kHz resolution	
234 MHz	3840 channels x Pol	61 kHz resolution	
117 MHz	3840 channels x Pol	30.5 kHz resolution	
58.6 MHz	3840 channels x Pol	15 kHz resolution	

ALMA correlator summary

- 4 independent basebands
- ~70 modes:
 - 2 GHz to 31 MHz bandwidth / 8192 channels / 1,2 or 4 pol products
 - Varying sampling options (better sensitivity with degraded resolution)
 - Continuum mode
- Possibility to observe many spectral windows/baseband (with same or different resolution/width, polarisation properties...)



ALMA calibration

Phase calibration

- Bright unresolved sources (mostly quasars from AT20G, Planck ...)
- Fast switching on calibrators within 2° every few min
- Water vapour radiometry (emission at 183GHz atmospheric line, deduce phase fluctuations on 1s timescale)
- positional accuracy $< 1/10$ synthesized beam-width

Flux density scale (primary)

- Planets/moons can be used (Neptune, Titan)
- Asteroids, Radio stars, quasars depends on quality of models, frequency, configuration...
- Initial expected accuracy $< 5\%$ B3, $< 10\%$ B6-7, $< 20\%$ B9

Bandpass calibration

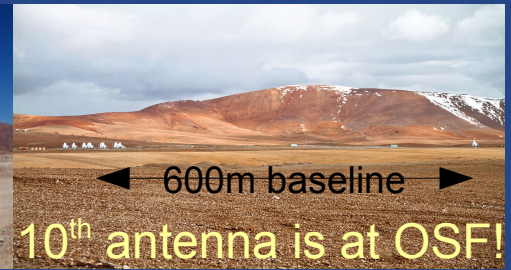
- Bright unresolved sources (mostly quasars from Planck catalogues)

Polarisation calibration

- Well known polarized or unpolarized sources (edges of planets/moons?). Still under characterization.



ALMA status & next milestones



Science Verification

- On-going to observe known sources to validate the output of ALMA
- Data made public (in June): not for science

Early Science

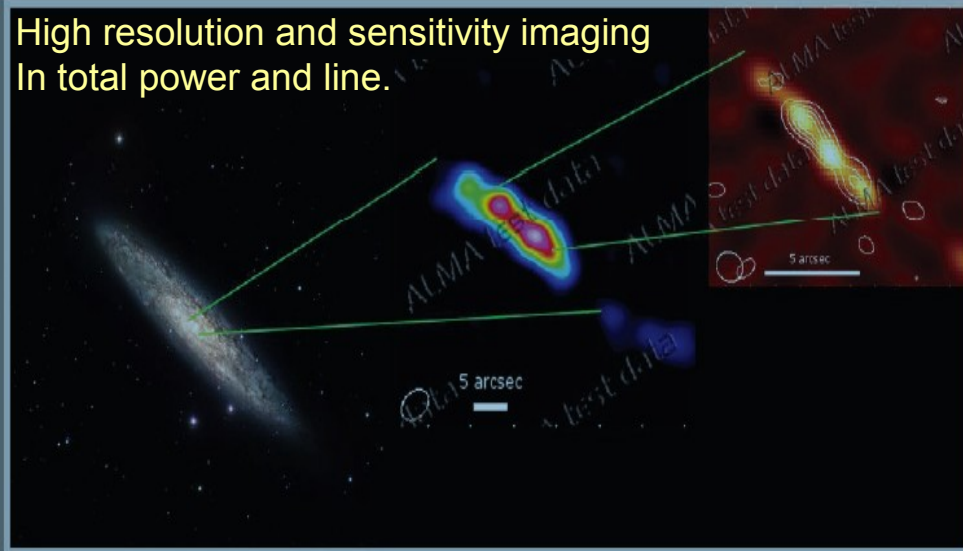
- 31 March: call for proposals and ALMA Science Portal opening
- 29 April: deadline for notice of intent (not compulsory): 601 arrived!!!
- 1 June: opening of the archive for proposal submission
- 30 June: proposal submission deadline
- 30 September 2011 - 30 June 2012: ES Phase 0 observations (500-700 h)

<http://almascience.eso.org/call-for-proposals>



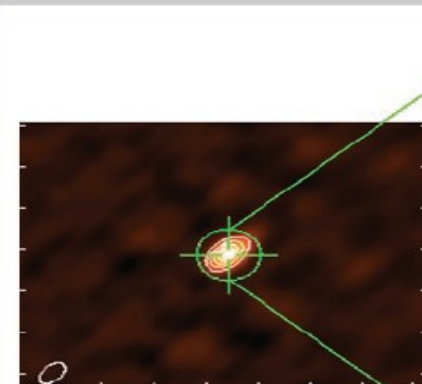
First tests of science with ALMA

High resolution and sensitivity imaging
In total power and line.



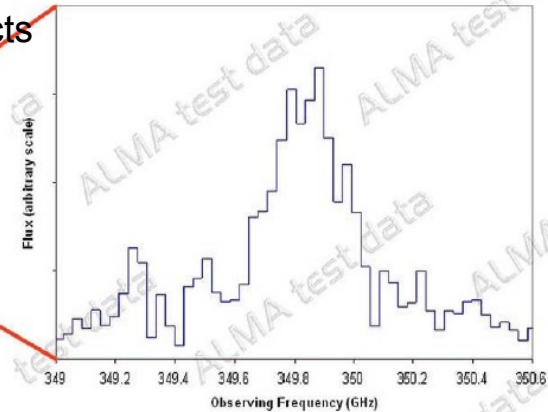
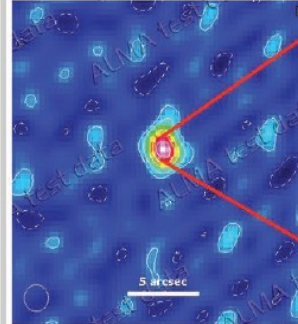
This shows the well-known spiral NGC253, with an optical image of the whole galaxy on the left (credit: ESO). The ALMA test images show dense clouds of gas in the central regions of the galaxy: (middle) the CO J = 2-1 line at 230 GHz and (right) the continuum and CO J = 6-5 line at 690 GHz.

An example of ALMA's potential as a spectroscopic instrument: on the left is the map of the molecular "hot core" G34.26+0.15, which is unresolved with the short baselines that we are presently using, so the "image" is not very interesting whereas a section of the spectrum near 100 GHz shows a "forest" of molecular lines. A few of the chemical species that are responsible for the emission lines are identified on the plot.



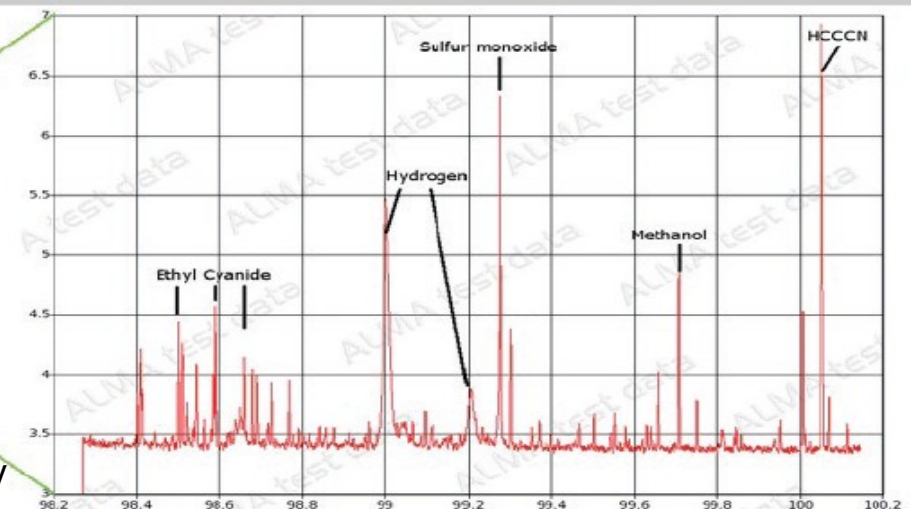
High resolution spectroscopy

Study of high-z objects



As a test of ALMA's ability to observe broad spectral lines, we observed the quasar BRI 0952-0115, which is at a red-shift of $z = 4.43$. The object is again unresolved on short baselines, but the 158 micron line from ionized carbon is clearly detected in the spectrum, which is impressive given that this observation took only one hour in total.

ALMA 8 antennas hw/sw tests mid 2010



Full array

Early Science

Frequency range: **10 bands 30-900 GHz**

Antennas: **50x12m + ACA**

Sensitivity **0.15 mJy in 1 min at 230 GHz**

Max baseline: **150m-16km**

Resolution: **20 mas @ 230 GHz**
70 correlator modes

Mosaic capability

Pipeline reduction in Chile

4 bands (3, 6, 7, 9)

16x12m (no ACA)

0.5 mJy in 1 min at 230 GHz

2 configs: 18-125m
36-400m

1000 mas @ 230 GHz
14 correlator modes

Limited mosaic capabilities

Reduction @ ARCs

Band	Lower frequency [GHz]	Upper frequency [GHz]	Type
3	84	116	2SB
6	211	275	2SB
7	275	373	2SB
9	602	720	DSB

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



ALMA-ES correlator summary

- ~~4 independent basebands~~ Same mode for all the basebands
- ~~~70 modes:~~ 14 modes
 - 2 GHz to 31 MHz bandwidth / 8192 channels / 1,2 ~~or 4 pol~~ products
 - ~~Varying sampling options (better sensitivity with degraded resolution)~~
 - Continuum mode
- ~~Possibility to observe many spectral windows/baseband (with same or different resolution/width, polarisation properties...)~~ Only one spectral window per baseband



ALMA Tools



Fundamentals of ALMA observations

ALMA will be dynamically scheduled in service mode

Some tools:

- the Science Portal and the Helpdesk (SP)
- the Observing Tool (OT)
- the Splatalogue
- the Common Astronomy Software Application (CASA)
- the Observation Support Tool (OST)

Thought to be suited both for experienced and non experienced observers.

**Care about the limitations in resolution
and sensitivity for the ES!**

**ALMA ES is ok for few hours, limited scope projects!
Furthermore, experience in mm interferometry is needed
among investigators because data won't pass through the pipeline
Calibration quality is being assessed!**



ALMA project checklist

Have a good idea!

Estimate required configuration

(CASA, Splatalogue, OST, OT)

Write the proposal idea in pdf docs

(max 5 page)

Register to the Science Portal

(SP)

PHASE I – Proposal submission

(OT, SP, Helpdesk)

TAC evaluation

PHASE II – Observing program

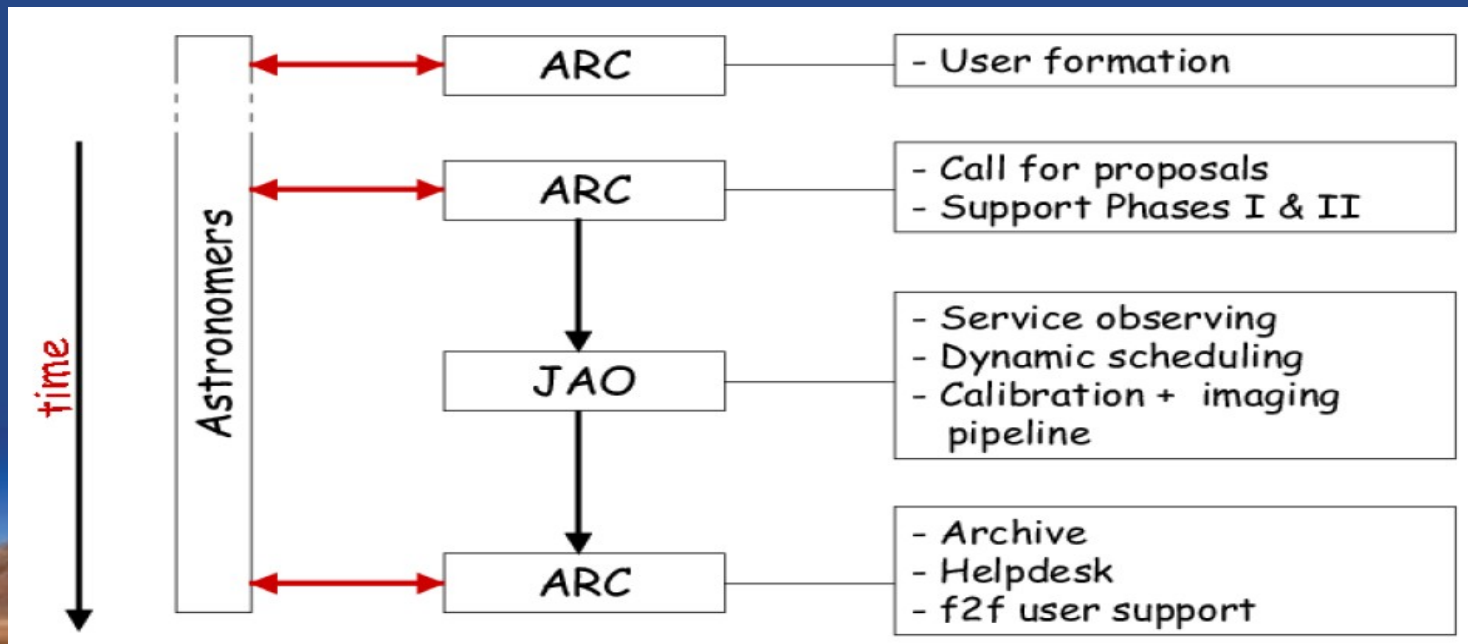
submission for accepted proposals

(OT, SP, Helpdesk)

Observations

Data reduction and analysis

(CASA)



ALMA simulations (Observation Support Tool)

<http://almaost.jb.man.ac.uk/>



Submit a request for a full simulation of ALMA capabilities for your target
Receive the results via e-mail

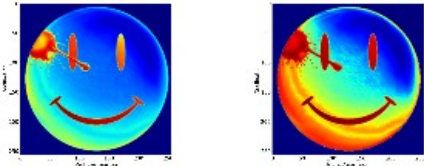
Array	Instrument	ALMA	Queue Status • Help
Sky Setup	Source model	OST Library: Central point source	Choose a library source model or
	Upload a FITS file	<input type="button" value="Browse..."/>	You may upload your own model
	Declination	-35d00m00.0s	Ensure correct formatting of this s
	Image peak / point flux in mJy	0.0	Set to 0.0 for no rescaling of sour
Observation Setup	Central frequency in GHz	90	The value entered must be within
	Bandwidth in MHz	32	Use broad for continuum, narrow
	Required resolution in arcseconds	1.0	OST will choose config if instrumen
	Pointing strategy	Single	Selecting single will apply primary
	Start hour angle	0.0	Deviation of start of observation f
	On-source time in hours	3	Maximum duration is 24 hours
	Number of visits	1	How many times the observation i
	Number of polarizations	2	This affects the noise in the final n
Corruption	Atmospheric conditions	Good (PWV = 0.5 mm)	Determines level of noise due to v
Imaging	Imaging weights	Natural	This allows a resolution / sensitiv
	Perform deconvolution?	No (Return dirty image)	Apply the CLEAN algorithm to deconv



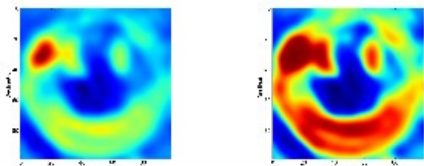
Job ID: 20110330175645 / Submitted by: casasola@ira.inaf.it

Overview

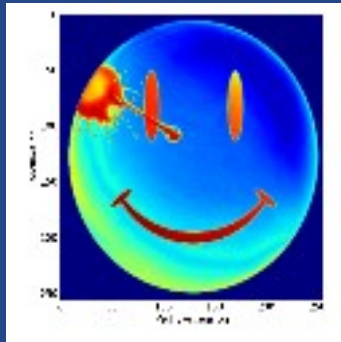
Click thumbnails to view full-size images. Left: linear colour scale, right: with histogram equalization.

Array configuration	Early Science ALMA (Compact Cycle 0, 125 m baseline)
Source model	All we ever see of stars are their old photographs
	
Maximum elevation	77.88 degrees
Central frequency	90 GHz = Band 3
Bandwidth	0.032 GHz
Track length	3 hours x 1.0 visits
System temperature	Tsys = Trec + Tsky = 37.0 + 4.42 = 41.42 K
PWV	0.5 mm
Theoretical RMS noise	0.000103323597098 Jy (in naturally-weighted map)
Restoring beam (resolution)	Major axis = 6.229 arcsec, minor axis = 5.176 arcsec, PA = 55.607 deg

Data products

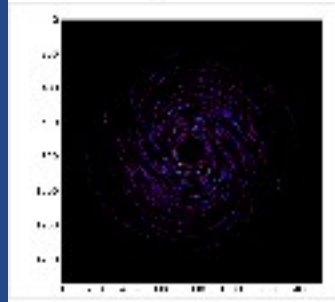
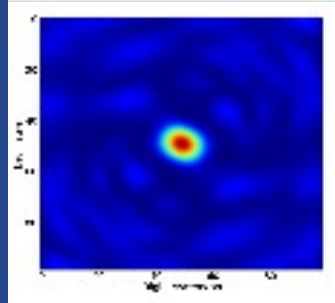
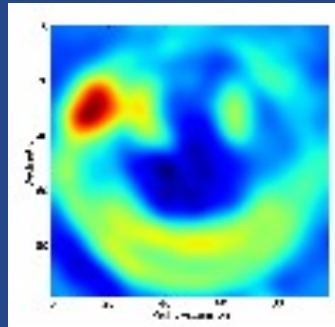
	
Your simulated image Download FITS file	

ALMA simulations (Observation Support Tool)

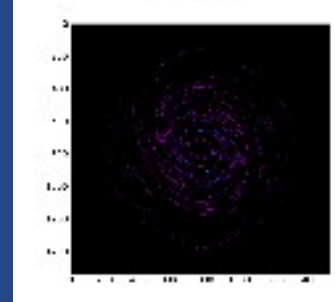
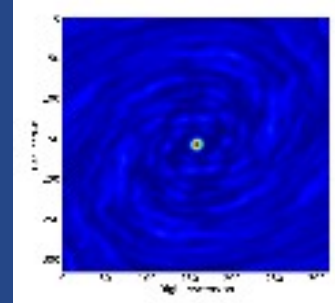
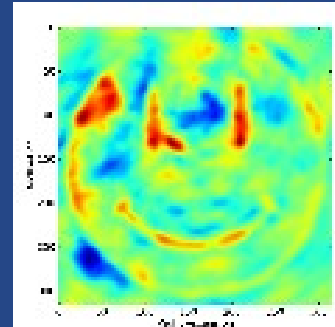


Model

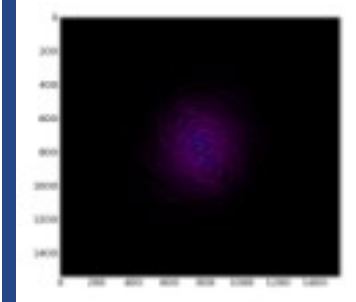
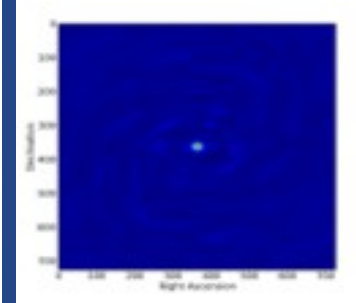
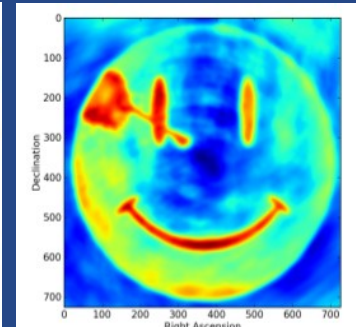
Images



B3 3h
Early Science
Compact config



B3 3h
Early Science
Extended config

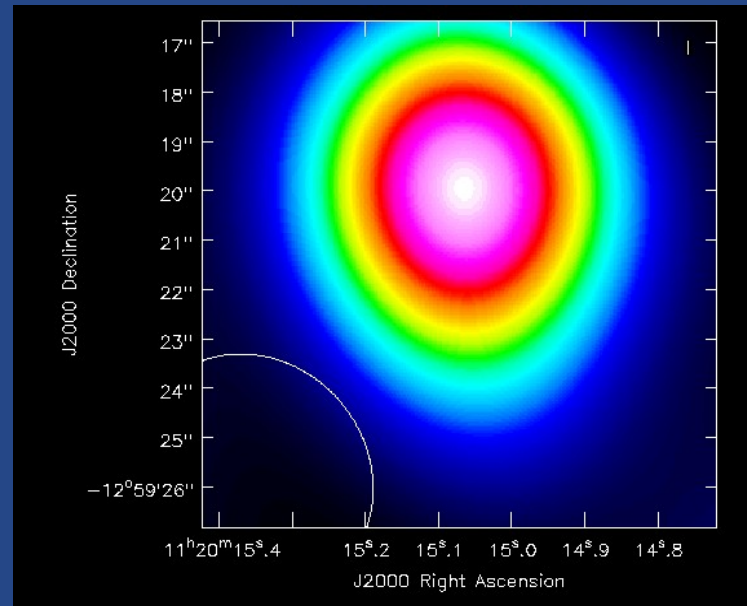
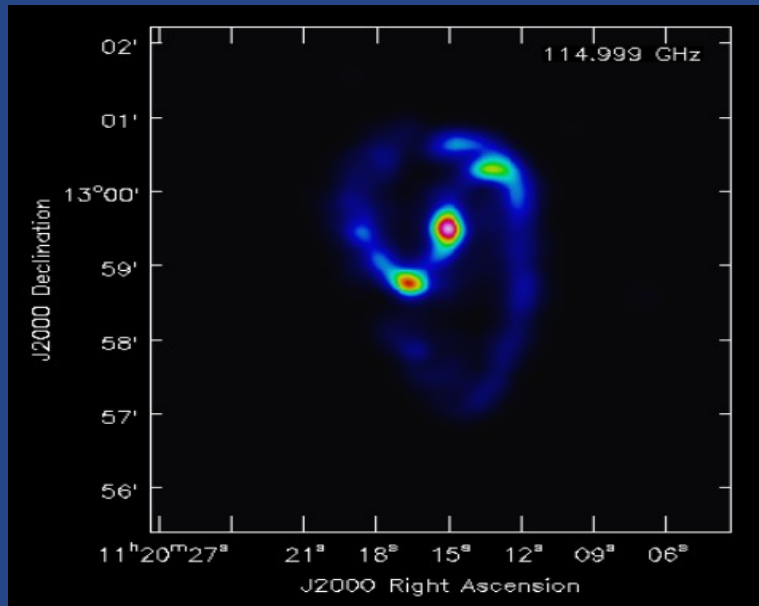


B3 3h
Full ALMA
Compact config

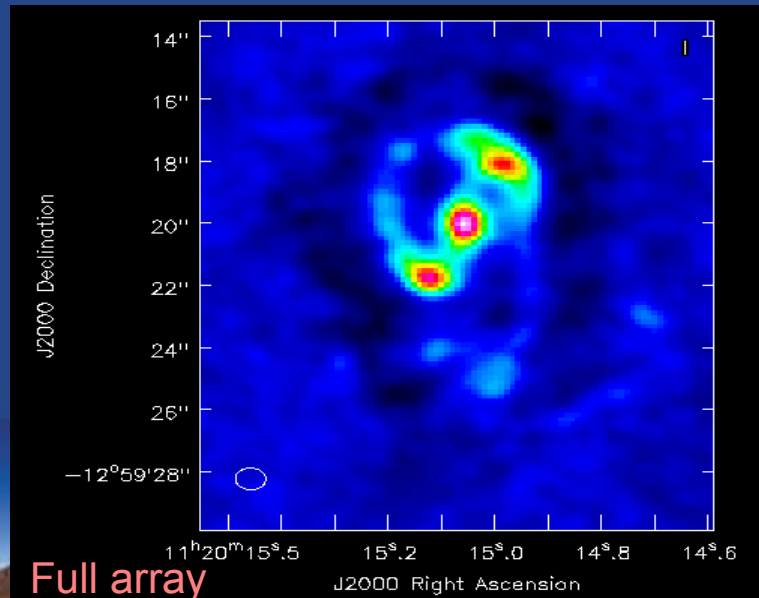


ALMA simulations (CASA simdata)

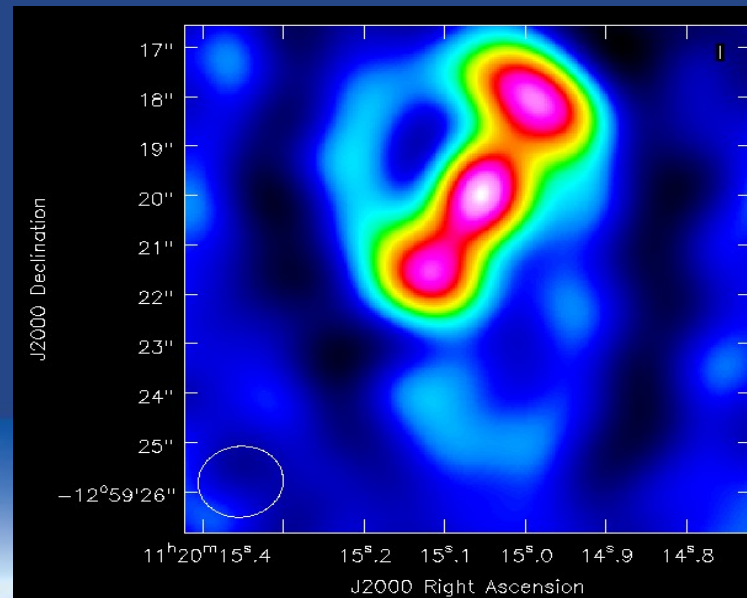
Simulation of NGC3627 @ $z=0.1$



Early Science
Baseline 250m



Full array



Early Science
Baseline 450m

The Science Goal: Sensitivity Calculator

<http://almascience.eso.org/call-for-proposals/sensitivity-calculator>

Sensitivity Calculator — ALMA Scienc...

ALMA Science

Call for Proposals

Capabilities

Road Map

Proposers Guide

Technical Guide

Observing Tool

Sensitivity Calculator

Notice of Intent

ALMA Data

Documents & Tools

User Services at ARCs

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

Additional information is available to users on the valid range for each parameter by hovering your mouse pointer over each field in the calculator applet (this does not currently work in Safari). [The ALMA Sensitivity Calculator Guide](#) gives a brief description of how the ASC works.

The calculator defaults to the number of antennas available during Cycle 0, but the user can select a higher number of antennas in order to compare the capability in future cycles. **The resulting integration times refer only to the on-source time and do not take any kind of overheads into account.** Furthermore, the ASC calculates the integration time/sensitivity for a single pointing. The case of pointed mosaics is discussed in the [Technical Guide](#).

A Java Plug-in must be installed in order to run the calculator. If the calculator is not displayed, then it is likely that this plug-in is not installed. Instructions for installing the plug-in may vary, depending on the browser and operating system used. A Plug-in compatible with the Java Development Kit version 1.5 or 1.6 (i.e. Java 5 or 6) is required. Users should contact their local IT department for installation help if necessary.

Common Parameters

Dec	00:00:00.000	
Polarization	Dual	▼
Observing Frequency	345.0	GHz ▼
Bandwidth per Polarization	2.0	GHz ▼
Water Vapour Column Density	Calculator Chooses ▼	
tau/Tsky	tau=0,211, Tsky=55,786 K	
Tsys	176,979 K	


Individual Parameters

	12m Array		7m Array		Total Power Array	
Number of Antennas	16		0		0	
Resolution	3.0	arcsec ▼	5,974554 arcsec		14,936385 arcsec	
Sensitivity(rms)	0.01	Jy ▼	0,00000	Jy ▼	0,00000	Jy ▼
(equivalent to)	0,01258	K ▼	0,00000	K ▼	0,00000	K ▼
Integration Time	0,79558	s ▼	∞	d ▼	∞	d ▼

Integration Time Unit Option Automatic ▼

Calculate Integration Time

Calculate Sensitivity



The ALMA Science Portal

<http://almascience.org/>

Welcome to the ALMA Science Portal



Atacama Large Millimeter/Submillimeter Array

In search of our Cosmic Origins

Search Site

Portals: [ESO](#) [NRAO](#) [NAOJ](#)

Registration
and login

[mmassardi](#) [Log out](#) [Profile](#) [Change password](#)

Home

About ALMA

ALMA Science

Call for Proposals

ALMA Data

Documents & Tools

User Services at ARCs

Welcome to the ALMA Science Portal at ESO

Technical info

Info about the Early Science

Details about the CfP

Sensitivity Calculator,
OT, OST, CASA

Helpdesk

- [ALMA@ESO](#)
- [ALMA@NRAO](#)
- [ALMA@NAOJ](#)

General News

First general news item
Feb 23, 2011

More...

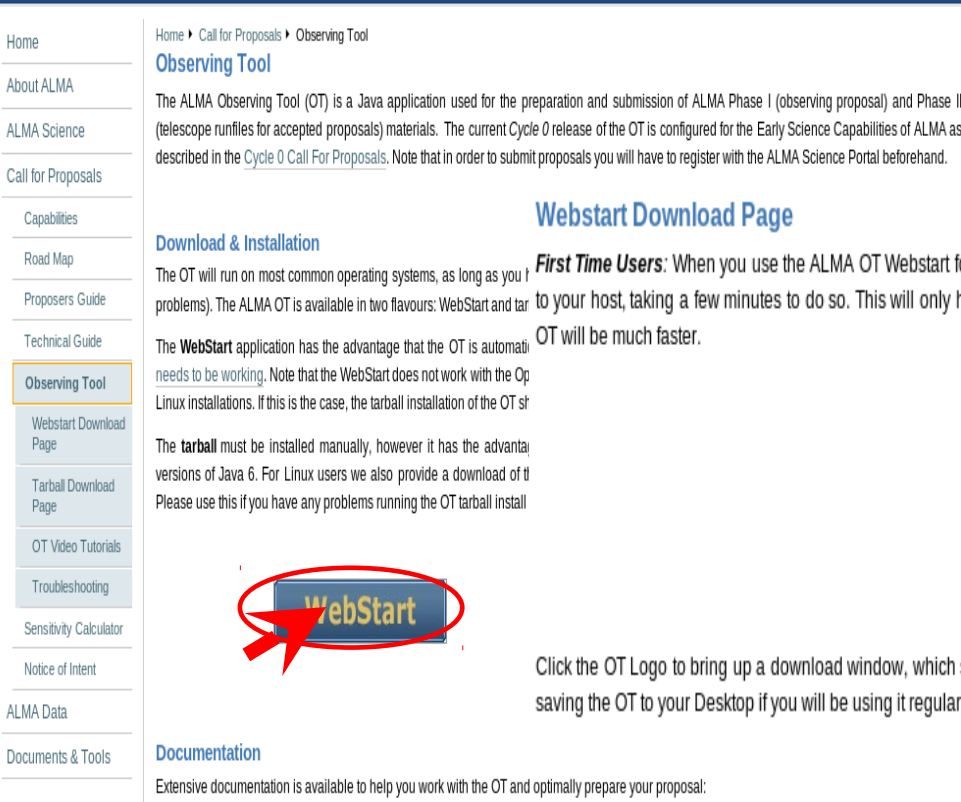
Local News

First local news item
Feb 23, 2011

More...

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

The ALMA Observing Tool



The screenshot shows the ALMA Observing Tool website. On the left is a navigation menu with links: Home, About ALMA, ALMA Science, Call for Proposals, Capabilities, Road Map, Proposers Guide, Technical Guide, **Observing Tool** (highlighted), Webstart Download Page, Tarball Download Page, OT Video Tutorials, Troubleshooting, Sensitivity Calculator, Notice of Intent, ALMA Data, and Documents & Tools. The main content area has a breadcrumb trail: Home > Call for Proposals > Observing Tool. Below this is the title 'Observing Tool' and a paragraph explaining that 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.

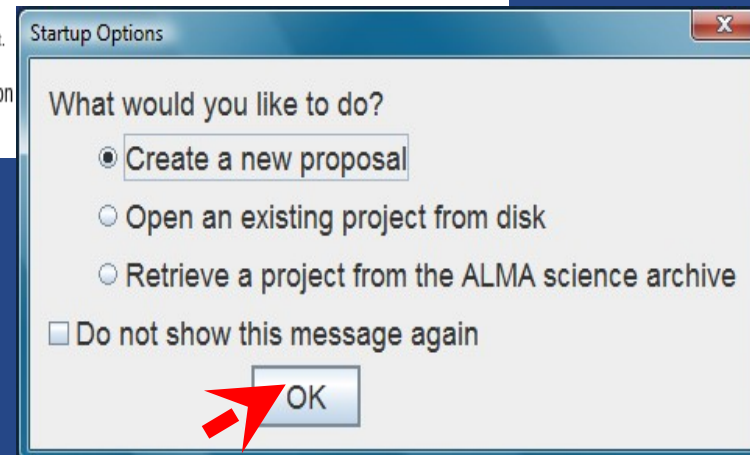
Below the paragraph is the 'Webstart Download Page' section. It has a sub-section 'Download & Installation'. The text explains that the OT will run on most common operating systems, as long as you have Java installed. The ALMA OT is available in two flavours: WebStart and tarball. The WebStart application has the advantage that the OT is automatically installed and needs to be working. Note that the WebStart does not work with the OpenJDK 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 of being able to run on older versions of Java 6. For Linux users we also provide a download of it. Please use this if you have any problems running the OT tarball installation.

There is a 'WebStart' button with a red arrow pointing to it. Below the button is the text: 'Click the OT Logo to bring up a download window, which should give you the option of saving the OT to your Desktop if you will be using it regularly.'

At the bottom of the page is a 'Documentation' section with the text: 'Extensive documentation is available to help you work with the OT and optimally prepare your proposal.'

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.



OT is a java-based client program,
requires Java 1.6 (currently), runs on Linux (various distr.),
MacOS (10.5-10.6), Windows (>XP).

The graphic interface allows one to get help/feedback
and hints even with small knowledge of the system.

OT structure

My new idea - Observing Tool for ALMA (Early Science), version R8.0.1

File Edit View Tool Search Help

Perspective 1

Project Structure

Proposal Program

My new idea

- My new idea
 - Proposal
 - Planned Observing
 - Science Goal ()
 - Description
 - Field Setup
 - Calibration Setup Parameters
 - Spectral Setup
 - Control and Performance Parameters

Proposal panel

Template library. Turn the keys on the JTree below & read the

- Template library. Turn the keys on the JTree below & read the
 - Proposal
 - Planned Observing
 - Science Goal (Band 3 100 GHz (rest frame) d
 - Science Goal (Band 3 Nyquist-sampled mosa
 - Science Goal (Band 6 Mixed 219 GHz SSB Co
 - Science Goal (Band 6 13CO J=2-1 mapping d
 - Science Goal (Band 6 Mixed simultaneous 12
 - Science Goal (Band 9 700 GHz search for pat

Template panel

Editors

Spectral Spatial Proposal Catalog

Tab menu for viewer

Proposal Information

Proposal Title My new idea

Proposal Cycle 9999.4

Editors Panel

Abstract
(max. 300 words)

Feedback

Problems Information Log

Description



Suggestion

Feedback Panel

Overview

Project Overview Panel

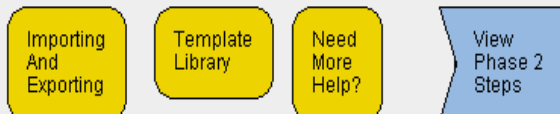
Contextual Help

1. Please ensure you and your co-Is are registered with the [ALMA user 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



Click on the overview steps to view the contextual help



The project properties

Project - Observing Tool for ALMA (Early Science), version Cycle0-RC1

File Edit View Tool Search Help

Perspective 2

Project Structure

Proposal Program

(unnamed project)

- Project
 - Proposal

Editors

Spectral Spatial **Project** Catalog

Principal Investigator

Main Project Information

Project

Assigned Priority

Project Code

Feedback

Problems Information Log

Descripti...	Suggestion

Overview



The project properties

Project - Observing Tool for ALMA (Early Science), version Cycle0-RC1

File Edit View Tool Search Help

Perspective 2

Project Structure

Proposal Program

(unnamed project)

- My new idea
 - Proposal

Feedback

Problems Information Log

Descripti... Suggestion

Editors

Spectral Spatial Proposal Catalog

Proposal Information

Proposal Title: My new idea

Proposal Cycle: 9999.5

Abstract (max. 300 words): My abstract goes here!

Launch Editor

Scientific Category

- ☒ Cosmology and the High Redshift Universe
- ☐ Galaxies and Galactic Nuclei
- ☐ ISM/Astrochemistry/Star Formation/protoplanetary disks/exoplanets
- ☐ Stellar Evolution/the Sun and the Solar System

Proposal Type

Overview



The project properties

Project - Observing Tool for ALMA (Early Science), version Cycle0-RC1

File Edit View Tool Search Help

Perspective 2

Project Structure

Proposal Program

(unnamed project)

- My new idea
 - Proposal

Editors

Spectral Spatial Proposal Catalog

Recent Publications

Investigators

	Title	Full name	Email	Affiliation	ALMA ID	
PI		Not set	Not set	Not set	Not set	NON

Select PI... Add Col... Remove Col Add fr

Science Case

Science Case(Mandatory, PDF, 5 pages max.) NewIdea_sciencecase.pdf Attach... De

Observatory Use Only

Feedback

Problems Information Log

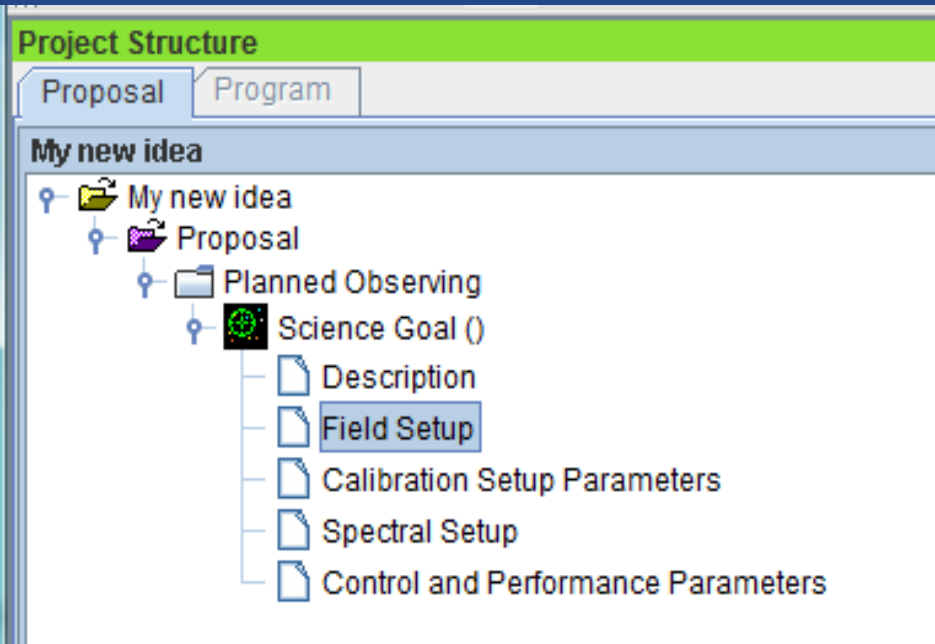
Descripti...	Suggestion
--------------	------------

Overview



The Science Goal concept

The OT divides the observing info of a project into “**Science Goals**”



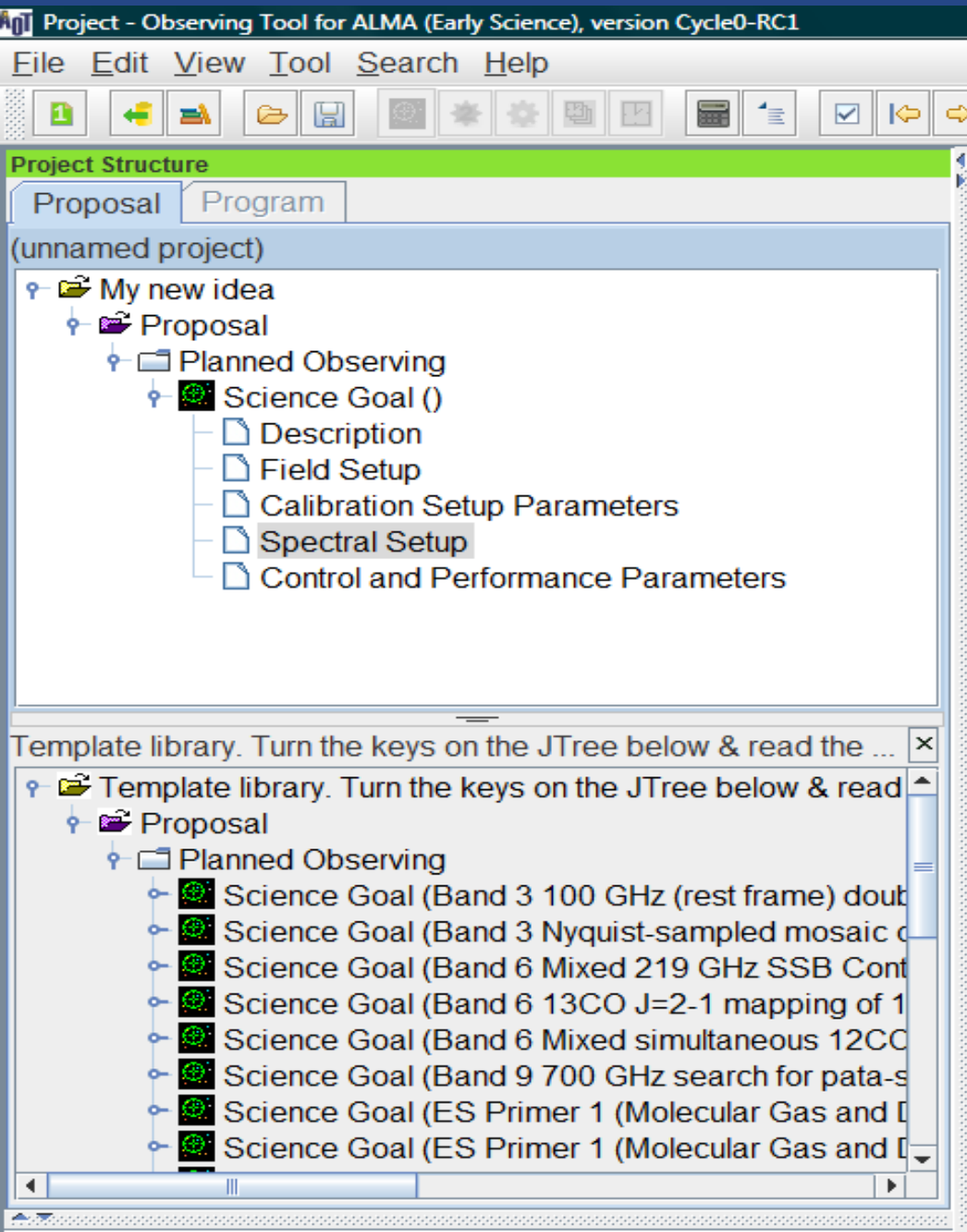
- A **Science Goals** is a container of
- an optional description of the goal
 - the **Field setup** to define the observing targets
 - the **Calibration setup**
 - the **spectral setup** to define the frequency range and correlator configuration
 - the **Control and Performance parameters** to define the sensitivity and resolution goals

Divide your targets into SG according to telescope configurations, sky area...

i.e. more than one source can be in a SG, but only one instrumental configuration; more than one SG can be in a proposal



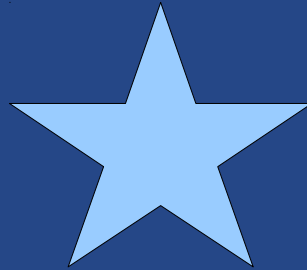
The Science Goal: Template Library



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 Target setup

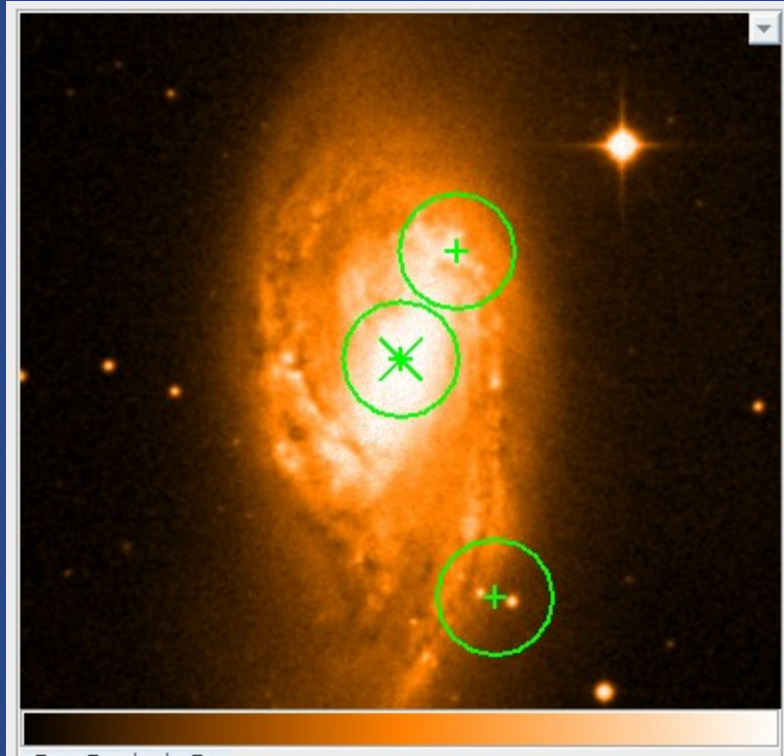


The Spatial visualizer

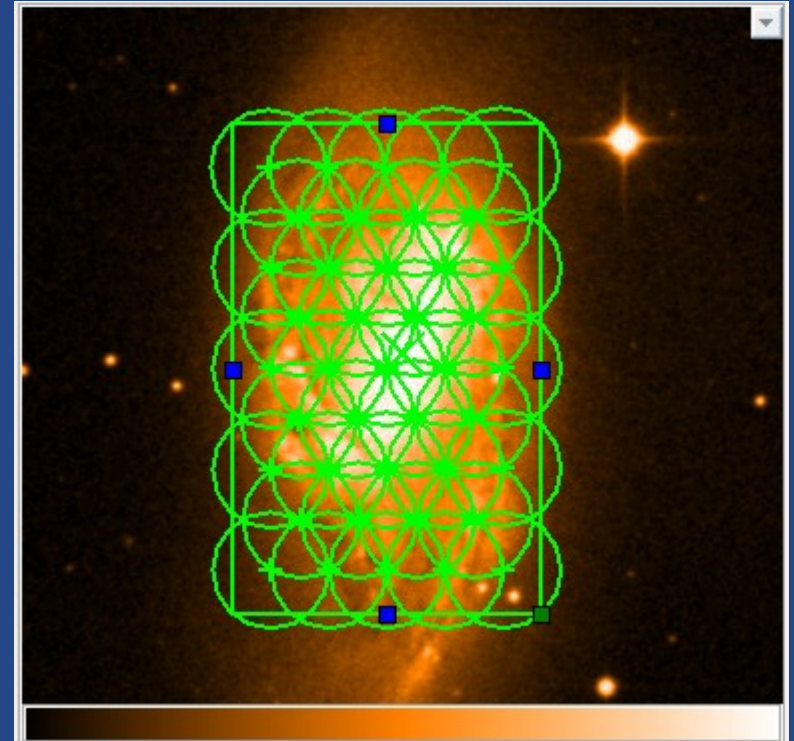
Always accessible through the tag menu.
Resolves known objects.
Add images from databases.
Overlay mosaic pattern and details.

Mosaicking

Single field pointings



Mosaic (up to 50 pointings in ES!)



The Calibration setup in the observing tool

*“...We **STRONGLY** suggest that you leave this choice at 'System-defined'...”
at least for the ES Phase 0*

The screenshot shows the 'Project - Observing Tool for ALMA, version Cycle0' interface. The 'Editors' pane is active, showing the 'Calibration Setup' tab. The 'Goal Calibrators' section has two radio buttons: 'System-defined calibration' (selected) and 'User-defined calibration'. Below these are three bullet points explaining the options. At the bottom, there are three buttons: 'Add Dynamic Calibrator...', 'Add Fixed Calibrator...', and 'Delete Selected Calibration'. A table at the bottom lists calibration intents and their target types.

Select calibration setup.
If "system" is selected, the ALMA system will select default calibrators.

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

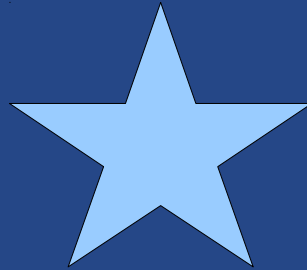
- When first selected, the table shows a reasonable set of calibrators to include.
- *Dynamic Calibrators* are found by a source catalogue query executed at project execution time. Edit the query with *Edit Criteria...*
- *Fixed Calibrators* are calibrators specified now, at project creation time. Specify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

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

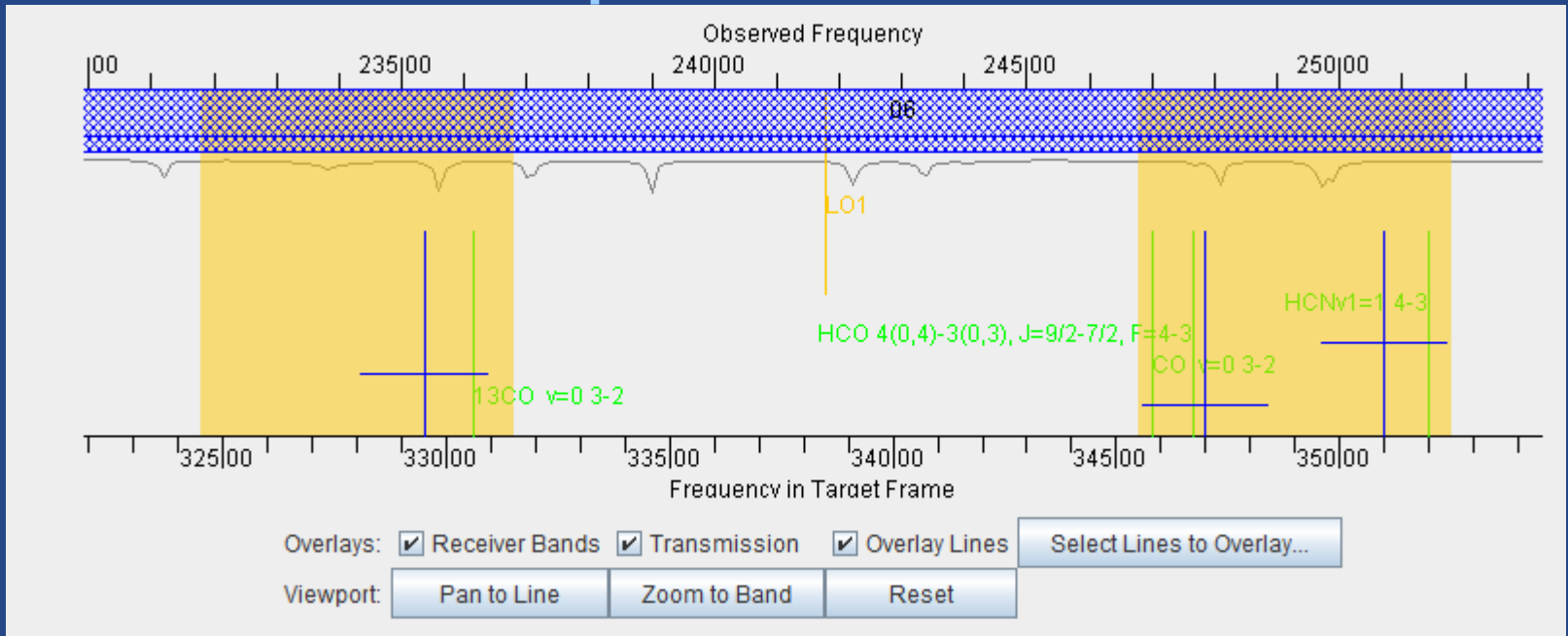
Calibration Intent	Target Type	Source Name	RA	Dec
Amplitude	Dynamic Calibrator		00:00:00.000 ± 20.00°	00:00:00.000 ± 20.00°
Pointing	Dynamic Calibrator		00:00:00.000 ± 20.00°	00:00:00.000 ± 20.00°
Phase	Dynamic Calibrator		00:00:00.000 ± 20.00°	00:00:00.000 ± 20.00°
Bandpass	Dynamic Calibrator		00:00:00.000 ± 20.00°	00:00:00.000 ± 20.00°

If user-defined calibration is necessary, care to justify it in the proposal!!!

The Spectral properties



The Spectral visualizer



Select Spectral Lines

Filter / Species

HCO

☒ Include description in search

ALMA Band

1 2 3 4 5 6 7 8 9 10

Sky Frequency (GHz)

Min 211 Max 373

Maximum Upper-state Energy (K)

0 20 40 60 80 100

Molecule Filter / Environment

Show all molecules

Reset Filters Search Online

Notes

- The initial database is an offline database, containing selected transitions from the full spectral line catalogue.
- Additional transitions from the full catalogue can be found by clicking Search Online.
- Search Online is only enabled when a species is given and one ALMA band is selected.
- Search Online does not (yet)

Transitions matching your filter settings

Transition	Description	Sky Freq.	Rest Freq.	Upper-state En.	Low Inten.	Sij μ^2
HCO 11(0,11)-10(1,10), J=21/2-19/2, F=10-9	Formyl Radical	243.745 GHz	341.243 GHz	274.33 K	0.5	2.39 D ²
HCO 4(0,4)-3(0,3), J=9/2-7/2, F=4-3	Formyl Radical	247.661 GHz	346.725 GHz	41.61 K	0.7	7.34 D ²
HCO v=0 4-3	Formylum	254.61 GHz	356.734 GHz	42.8 K	17.4	60.84 D ²

Add to Selected Transitions

Selected transitions

Transition	Description	Sky Frequency	Rest Frequency	Upper-state Energy	Low Intensity	Sij μ^2
13CO v=0 3-2	Carbon Monoxide	236.134 GHz	330.588 GHz	31.732 K	16.03	0.037 D ²
CO v=0 3-2	Carbon Monoxide	246.997 GHz	345.796 GHz	33.192 K	70	0.036 D ²
HCO 4(0,4)-3(0,3), J=9/2-7/2, F=4-3	Formyl Radical	247.661 GHz	346.725 GHz	41.61 K	0.7	7.34 D ²
HCN v=1 4-3	Hydrogen Cyanide	251.433 GHz	352.006 GHz	4806.68 K	2.6	36.42 D ²

Search for all the lines that might fall in your observing region: It might be enough to add a spectral window to improve your results! (but care to justify it in the proposal...)

The control and performances panel

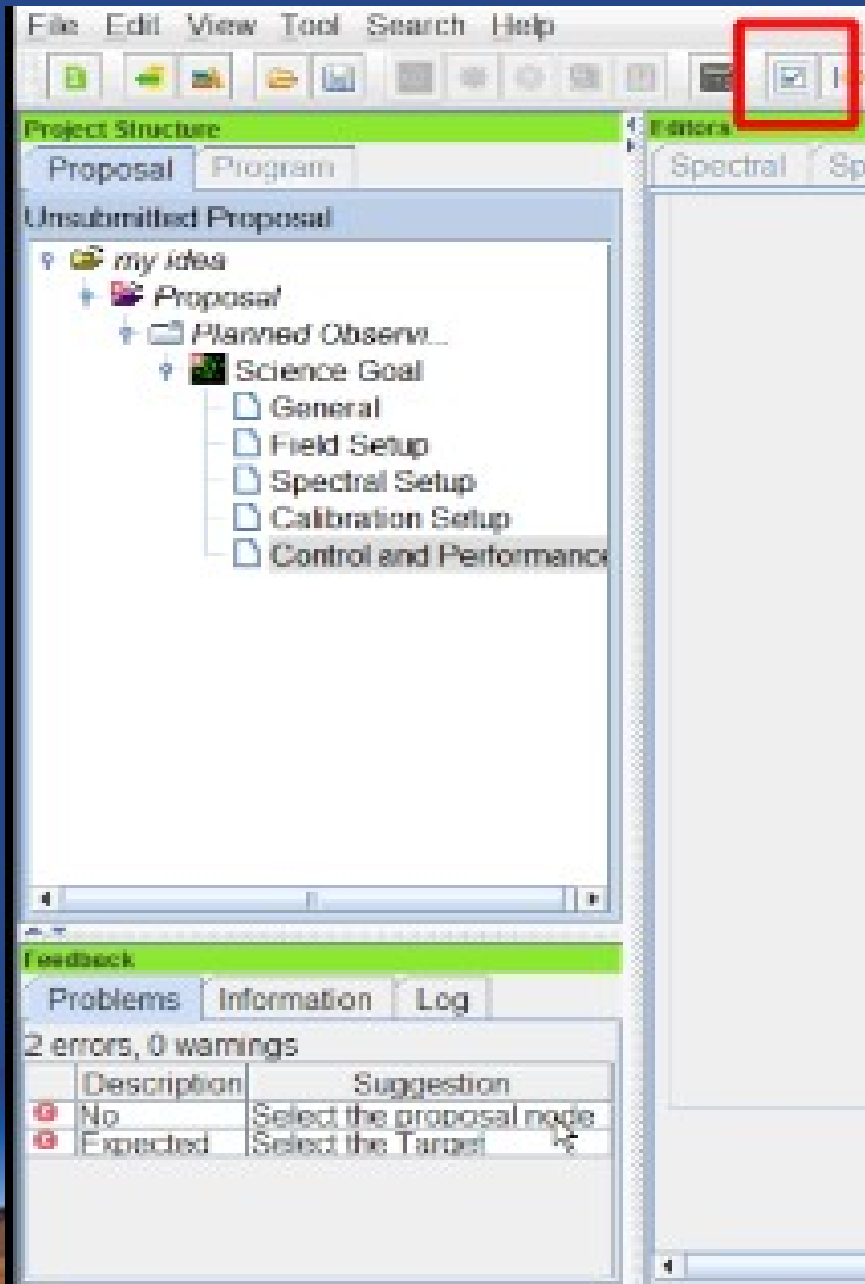


The Science Goal: Summary & tools

- Field setup:** Add as many targets as you want, in the same sky region
OT resolves for known objects
User ephemeris for moving bodies (comets, asteroids, TNOs)
Access online surveys for imaging
Use the interactive panel to draw on the image of your region
(or to define your mosaic)
- Calibration setup:** Fully automatic (easy!)
User setup with access to calibrator catalogues/queries
- Spectral setup:** Central frequency average for continuum
Hidden LO and correlator as possible (to make it easy)
Splatalogue available to identify lines
Limited configurations available for ES (up to 4 sp.windows)
- Performance control:** Timing is based on sensitivity goals (or viceversa)
Resolution determines the configuration
(no need to know where antennas are)
Low number of antennas and short baseline in ES




The summary, validation and submission



Validation at any stage
Save at any stage on your PC
Archive open for submission
on 01 June 2011

The summary, validation and submission

 MARCELLA MASSARDI		None Assigned			
PROJECT TITLE: My new idea					
PRINCIPAL INVESTIGATOR	Marcella Massardi	PROJECT CODE	None Assigned		
SCIENCE CATEGORY: Cosmology and the High		ESTIMATED TOTAL TIME:	0,6 h		
CO-PNAME(S): (Large Proposals only)					
CO-INVESTIGATOR NAME(S): Viviana Casasola					
EXECUTIVE SHARES(%)	NA:	0	STUDENT PROJECT? (Yes/No)	No	
	EU:	100			
	EA:	0			
	CHILE:	0	RESUBMISSION? (Yes/No)	No	
NONALMA:	0				
ABSTRACT					
Here is my abstract					
REPRESENTATIVE SCIENCE GOALS (UPTO FIRST 5)					
SCIENCE GOAL	POS.[J2000.0]	FREQUENCY	BAND	ANG.RES.('')	ACA?
ScienceGoal	05:19:49.734, -45:48:43.702	111,45917 GHz	3	3,0	N
Total # Science Goals : 1					
SCHEDULING TIME CONSTRAINTS (e.g. Co-ordinated observations already scheduled)					
NONE					
PICONTACT INFORMATION					
TITLE:	Marcella Massardi marcella.massardi@oapd.inaf.it	INSTITUTE & ORDEPT.:	N/A		
NAME:		ALMA EXECUTIVE:	EU		
E-MAIL:					
PHONE[FIRST]:		ADDRESS:			
PHONE[SECOND]:					
FAX:					

Validation at any stage
Save at any stage on your PC
Archive open for submission
on 01 June 2011

Modification/withdrawal of submitted
proposals before the deadline
(30 june 2011 for ES P0)

A further validation is performed
at the submission stage to guarantee
the correctness of the projects

Proposal Review process

Proposals will be reviewed by an **international proposal review committee**.

There will at least one Review Panel for each of the **main themes**:

- Cosmology and the High Redshift Universe

- Galaxies and Galactic Nuclei

- ISM, Star Formation/protoplanetary Disks and their Astrochemistry,

- Exoplanets

- Stellar Evolution, the Sun and the Solar System

The **ranked proposals** from the different panels and sub-panels will be merged into a single ranked list in the ALMA Proposal Review Committee (APRC) and **assigned a letter grade A through D**:

- A** the proposal will be carried over to the following cycle if it is not finished

- B** the proposal should be finished during the current cycle but will not be carried over to the next cycle.

- C** are 'filler' programs observed when no A or B can be scheduled

- D** proposals will not be observed.



PHASE II observing programs

Investigators will be notified of the result of the ALMA Proposal Review process via email and successful investigators will be invited to submit a detailed observing plan.

The ALMA Observing Tool (OT) is used to prepare individual Scheduling Blocks (SBs, about 30min for weather reasons)

The best SBs at any moment will be observed (science, weather, project status)

These will be used by the ALMA Scheduling Software to ensure that the observations are carried out under the required weather conditions.

The ALMA Regional Centers (ARC) will provide support to investigators in the Phase II process.

Once the Phase II preparation is finished the Scheduling Blocks will be submitted to the ALMA site and scheduled according to rank and requested observing conditions.

Investigators will be able to track the status of their project with the **ALMA Project Tracker**.



...and then?

For the ALMA full array a pipeline will be operating
PIs will receive fully reduced images+raw data+scripts

For Early Science the pipeline is being assessed
“...ALMA staff will conduct quality assurance on ALMA data...”
PIs will receive raw data+ quality assessment scripts

Proposer experience in radio-mm interferometry is
required to reduce Early Science data.
Support can be requested to the ARCs.

CASA scripting helps in calibration & reduction.

Care for the huge amount of data!!!



Getting help with ALMA



Documentation & Help

Contextual Help in the overview panel

Overview

Contextual Help

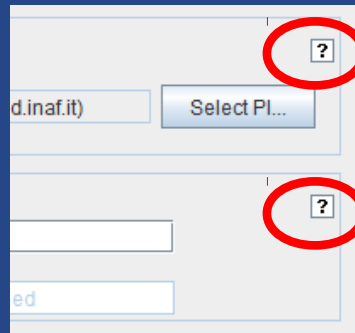
1. Please ensure you and your co-Is are registered with the [ALMA user portal](#)
2. Create a new proposal by either:
 - Selecting *File > New Proposal*
 - Clicking on the icon in the toolbar
 - Or clicking on this [link](#)
3. Click on the [proposal](#) tree node and complete the relevant fields.

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

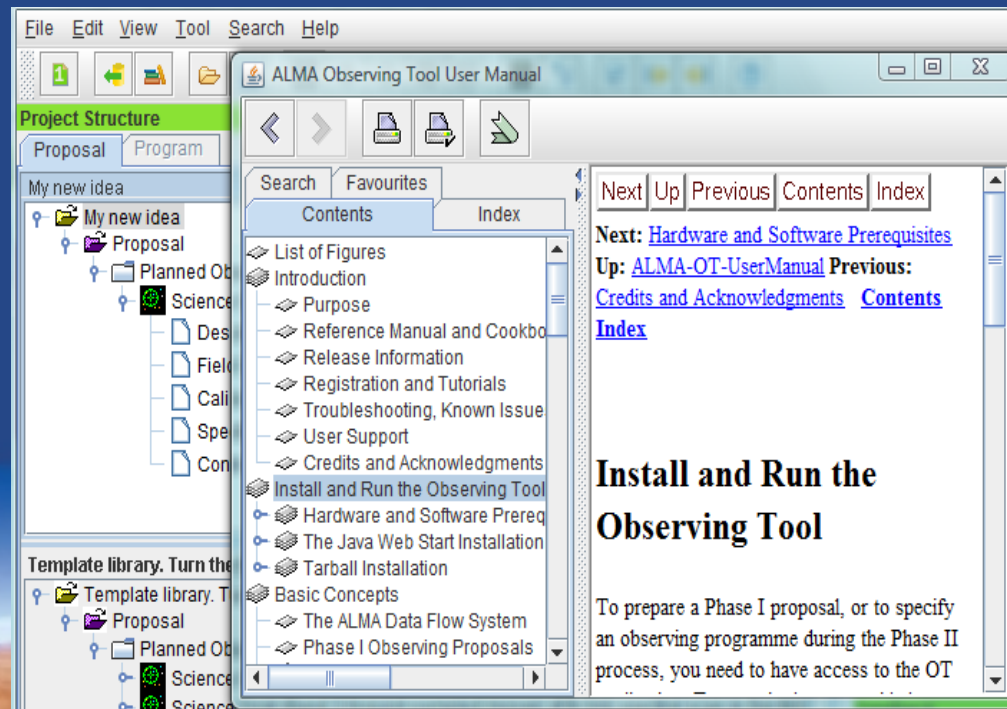
Importing And Exporting Template Library Need More Help? View Phase 2 Steps



Clickable instruction for each step

[http://almascience.eso.org/
document-and-tools/documents](http://almascience.eso.org/document-and-tools/documents)

OT manual, cookbook, guide available
on-board the OT (F1 key)
and/or on-line



The Helpdesk

Registered users can submit questions or help requests (**tickets**) for problems with ALMA products or procedures.

Urgent issues with the proposal submission process have a dedicated category.

The tickets enrich the knowledge database, where the HD can search for help.

<https://alma-help.nrao.edu/>

ALMA - Europe - Powered by Kay...

ALMA EUROPEAN ARC ALMA Regional Centre

05 Apr 2011

Support Center » Knowledgebase

Knowledgebase Categories

Knowledgebase articles are categorized. Please select which category you would like to browse. You can also search the knowledgebase using the search field beside this text.

ALMA (26)

- What are the latitude, longitude and altitude of the ALMA site on Chajnantor?
- What is ALMA?
- >> more topics

Articles

- Where can I find the online ALMA observing simulator developed by the University of Manchester?** ★★★★★
Please go to: <http://almaost.jb.man.ac.uk> It's fun!
- Where are the ARC websites?** ★★★★★
The ARC websites are: Europe: <http://www.eso.org/sci/facilities/alma/> North America: <http://science.nrao.edu/alma/> East Asia:
- Must I submit a Notice of Intent for Cycle 0 Proposals?** ★★★★★
Submitting a Notice of Intent is strongly encouraged, but not required. It takes only a few minutes. Deadline for Notice of Intent is 15:00 UT on April 29, 2011. You can submit it here: <http://almascience.nrao.ac.in/call-for-proposals/notice-of-intent>

Log In

Log In

Main Categories

ALMA (26)


Search

Search

-- Entire Support Site --

The Helpdesk

Support Center

 Logged in successfully



View Tickets

Submit new tickets, view existing tickets or create new replies.



Submit a Ticket

Submit a new ticket.



Knowledgebase

Search support articles and find answers to frequently asked questions.



Downloads

View our library of file downloads and links.

My Account [Logout]

Logged In: **Marcella Massardi**

Search




Search

-- Entire Support Site --



Popular Knowledgebase Articles

Views

 What do I do if I can't get the OT to work?	485
 How do I arrange a visit to one of the ARCs?	382
 Can I reduce ALMA data in software packages other than CASA, and is there support for that?	307

The Helpdesk



Support Center

Logged in

 Support Center » Submit a Ticket



Popular Knowledgebase

-  What do I do?
-  How do I do it?
-  Can I request support?



EUROPEAN ARC
ALMA Regional Center

Support Center » Submit a Ticket

Submit a Ticket

If you can't find a solution to your problem, please select the appropriate category below.

Select Category

- ☒ General Queries (EU) - Science Portal reviews and assessment, Project tracking, etc.
- ☐ Project Planning (EU) - Available Capabilities, Simulators, Splatalogue, other
- ☐ Observing Tool (EU) - Proposal Preparation
- ☐ Data Reduction (EU) - CASA, pipelines, etc.
- ☐ Archive and Data Retrieval (EU) - archival data
- ☐ Face to Face Support (EU) - Data reduction

[Next »](#) [Reset](#)

[Back](#)

[Home](#) | [View Tickets](#) | [Submit a Ticket](#) | [Knowledgebase](#)

Submit a Ticket

If you can't find a solution to your problem in our [knowledgebase](#), you can fill in the fields below with as much detailed information as possible and send it to our agents.

General Information

Priority:

Default ▼

General

Sub-Categories:

Please specify areas of concern

- ☐ Science Portal/Registration
- ☐ Documentation
- ☐ Webpages
- ☒ Proposal reviews and assessment (science and technical)
- ☐ Project tracking
- ☐ Other

Message Details




Subject: *

adding a spectral window

Hi, I'm refining my proposal and want to add a spectral window to the LSB...

Knowledgebase suggestions

The following articles from our knowledgebase might be relevant to what you're looking for. Please take the time to read them before submitting your ticket.

-  I want to observe 4 lines/bandpasses, 3 in one sideband and 1 in the other. Why can I not set this up in the OT?
Relevance: 100.00%
-  What do I do if I can't get the OT to work?
Relevance: 49.58%
-  When is the Cycle 0 proposal deadline and observing period?

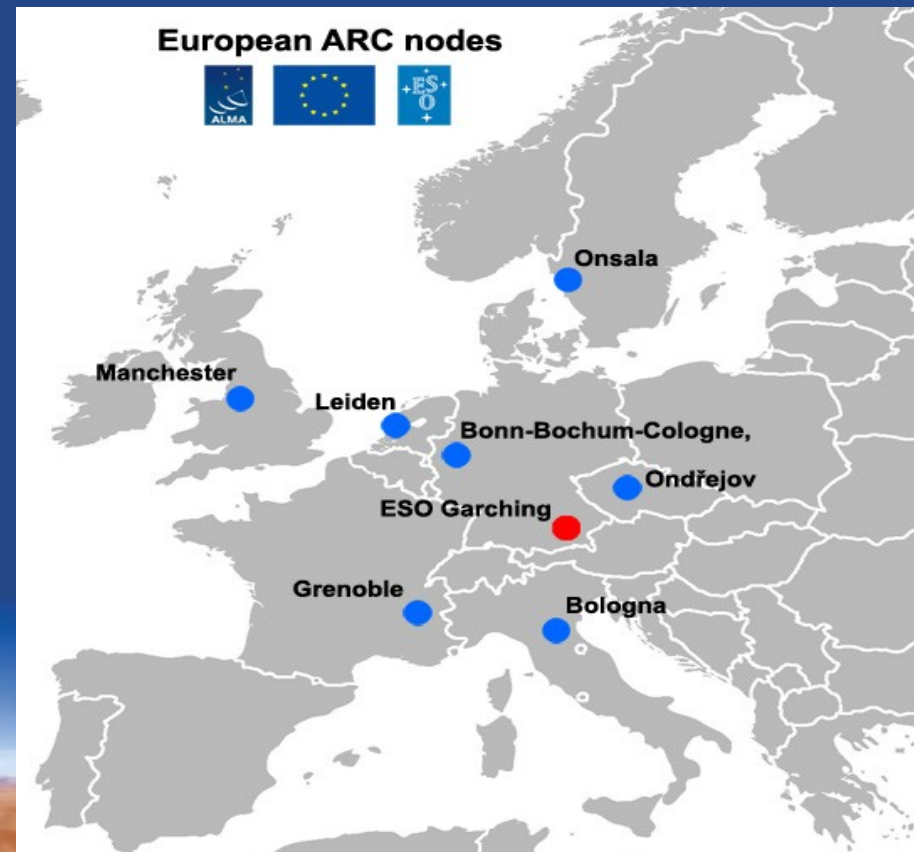
The ALMA Regional Centers (ARC)

- **Interface between JAO and users**
- 1 ARC per Partner:
 - NRAO for North America
 - NAOJ for East Asia
 - ESO for Europe
- Operation support
 - Archive replication
 - Astronomer on duty
 - Software tools
- User support
 - Community formation and outreach (schools, workshops, tutorials, ...)
 - Phase 1 (proposal preparation)
 - Phase 2 (scheduling block preparation)
 - Data analysis
 - Archive mining



The European ARC

- ESO European ARC distributed over a 7-nodes network
- ARC center at ESO: core tasks
 - Proposal handling
 - Archive
 - Data product support (ALMA data and software)
 - Helpdesk
- **ARC nodes:**
 - Face to face support
 - User formation
 - Advanced tools



The Italian ARC node

- Hosted by the IRA in Bologna
 - ARC Manager: Jan Brand
 - contribution from 6 members of IRA permanent staff
 - 1 tenured position (Massardi)
 - 4 Post-Docs (Casasola, Mignano, Paladino, Rossetti)
 - 1 system manager (Bedosti)
 - 1 ESO ALMA co-funded fellow (Boissier)
- **User support**
 - **Face to face (ALMA software)**
 - **Polarimetry, mosaicing, GRIDDING computations**
- Community formation
 - In 2010: community day and CASA tutorials
 - In 2011: tutorials or ALMA ES
 - **13-17 June 2011: Astrochemistry with ALMA school in Bologna**



Contact us!!!

**For your proposals, data reduction, ALMA related stuff
don't struggle on your computer:
contact us and/or organize your visit to IRA-ARC node**

**To ask f2f help send a ticket to the central helpdesk
indicating your “favourite” ARC node**

- **2 visitor stations available**
- **1 ARC node member dedicated to each visitor**
- **10 TB disk space available during your visit + 1 month for download**
- **No fundings available for visitors**

Helpdesk: <https://alma-help.nrao.edu/>

Web: <http://www.alma.inaf.it>



Request for a f2f visit!!!



Support Center » Submit a Ticket

Submit a Ticket

If you can't find a solution to your problem in our [knowledgebase](#), you can fill in the fields below with as much detailed information as possible and send it to our agents.

Select Category

- ☐ General Queries (EU) - Science Portal/Reg reviews and assessment, Project tracking,
- ☐ Project Planning (EU) - Available Capabilities, Simulators, Splatalogue, other
- ☐ Observing Tool (EU) - Proposal Preparation
- ☐ Data Reduction (EU) - CASA, pipeline processing
- ☐ Archive and Data Retrieval (EU) - archive information
- ☒ Face to Face Support (EU) - Data reduction

Next »

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Submit a Ticket

If you can't find a solution to your problem in our [knowledgebase](#), you can fill in the fields below with as much detailed information as possible and send it to our agents.

General Information

Priority:

Default ▼

EU Visitor

Preferred ARC Node for Support: *

Italian ▼

Type of Support Required: *

Proposal Preparation ▼

Project ID:

Number of Visitors: *

Proposed begin and end dates for your visit: *

01 June - 08 June 2011

Areas of expertise: *

Areas of expertise relevant to your visit

extragalactic CO lines

Special Computing Requirements:

(disk space, etc.)

Permission To Access Data:

By checking this box, you give the ARC staff permission to access your data prior to the visit for preparation purposes.

☒ Yes

Financial Support Required:

☐ Yes

Justification for Financial Support:

This field is required if the visitor requests financial

Web: <http://www.alma.inaf.it>



+



[Home](#)

[Contact us](#)

Local Staff

Local Resources

Reports & Documents

Meetings & Talks

- ALMA Info
- ALMA Science Portal
- ALMA Helpdesk
- ALMA OT

- ESO: Alma
- German ARC
- Dutch ARC
- U.K. ARC
- Nordic ARC
- IRAM ARC
- Czech ARC
- NRAO: Alma

Search

A classification of

Our ARC node staff will support the ALMA users in all the steps of their projects, by helping in

- using the ALMA tools for proposal preparation and submission
- improving the observing strategy
- tracking the project status
- reducing data with CASA
- analyzing data in continuum, spectral lines, mosaic, polarization
- archive mining
- handling ALMA large amount of data (also through GRID)

What's on

ASTROCHEMISTRY WITH ALMA

The Italian ALMA Regional Centre and the Osservatorio Astrofisico di Catania organize a Training School "Astrochemistry with ALMA".

The School is funded by the EU through ITN [LASSIE](#) Network and [COST](#) Action CM0805.

Date: 13 - 17 June 2011

Venue: Research Campus, CNR Bologna

The School will consist of general introductory lectures which will present the ALMA project and its potential impact on astrochemistry.

The focus will be on chemistry in star forming regions, in envelopes of evolved stars, and in comets.

The School is open to students of all backgrounds (experimental, observational, theoretical) and is meant to provide researchers not actively involved in interferometry with a basic knowledge for a successful use of ALMA.

- Updated ALMA Science Portal
- ALMA Cycle 0 Call for Proposals is now open

- Dutch ALMA Workshop, Leiden, Netherlands, 20-21 April 2011
- The Nordic ARC invites applications for an indefinite Staff Astronomer position.
- ESO Takes Delivery of State-of-the-art Receiver

Username

massardi

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●●●●●●●●

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Summary

- **ALMA is a unique instrument in the (sub-)mm (0.3 to 10 mm) range**
 - Unequaled sensitivity
 - Large collecting area (7200 m²), excellent dry site (5000 m altitude)
 - e.g. 6 uJy in 6h @ 230 GHz
 - Great imaging capabilities
 - 50 antennas +ACA, variable configuration
 - High resolution (15km = 40 mas @ 100 Ghz, 5 mas @ 900GHz)
 - Flexible spectral configuration
 - Pipeline reduced data
- **Early Science proposal submission deadline on 30th of June**
(care for the limited capabilities !!!)
 - 16 antennas, baselines up to 450m, reduced number of spectral modes
- **Tools are designed to help the experienced AND non experienced user to use ALMA.**
 - Access to the ALMA world through the Science Portal and the ALMA Observing Tool



Enjoy your ALMA proposals !!!!!

**Contact the Helpdesk and
your ARC node for support**

Web: <http://www.alma.inaf.it>

Email: help-desk@ira.inaf.it

Helpdesk: <https://alma-help.nrao.edu/>

Useful links:

ALMA SP: <http://almascience.org/>

ALMA PRIMER FOR ES: <http://almatelescope.ca/ALMAPrimer.pdf>

ALMA CfP: <http://almascience.eso.org/call-for-proposals>

