ALMA Observing Tools

Italian ALMA Regional Center

INAF-Istituto di Radioastronomia (Bologna)

Tutorials , April-May 2011

ALMA basics

ALMA Early Science

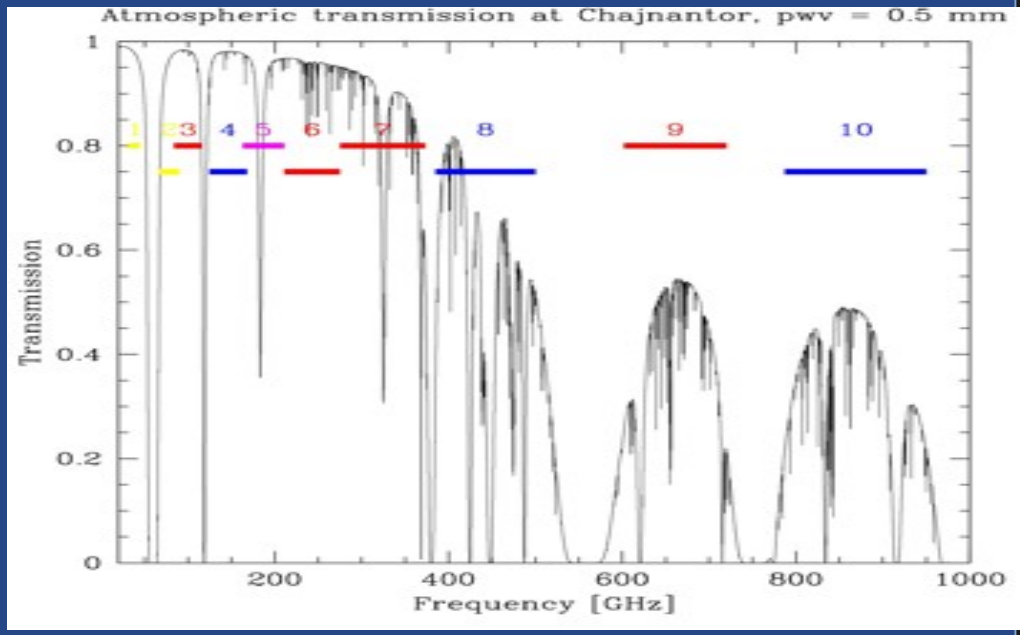
Hints to use the ALMA tools

Support for ALMA users

ALMA overview and Early Science

ALMA numbers

- The Atacama Large Millimeter Array is a **mm-submm reconfigurable interferometer**
- Under construction on the Chajinantor 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),

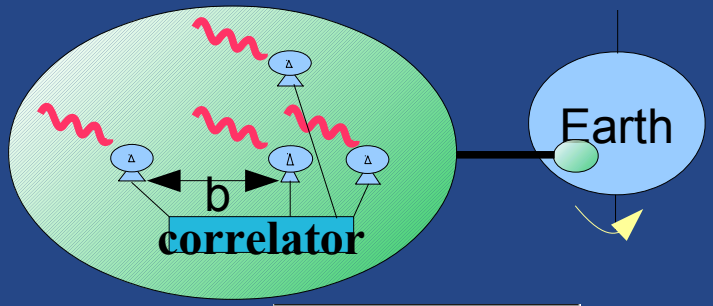
  East Asia: NAOJ (Japan, Taiwan),

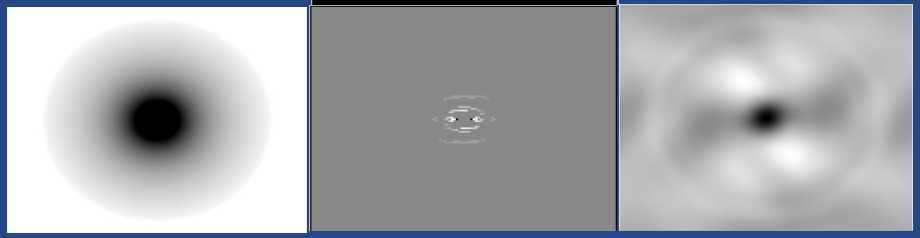
  Chile
- Contributors share the observing time

ALMA numbers

- The Atacama Large Millimeter Array is a **mm-submm reconfigurable** interferometer
- Located on the Chajinantor 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





Object Fourier space Image space

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

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 Tsys, 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" x (300/freq_GHz)x(1km/max_baseline)
40 mas @ 100 GHz,
5 mas @ 900 Ghz
FOV 12m array: **20.3"/(300/freq_GHz)**

Flexibility in spectral and spatial studies

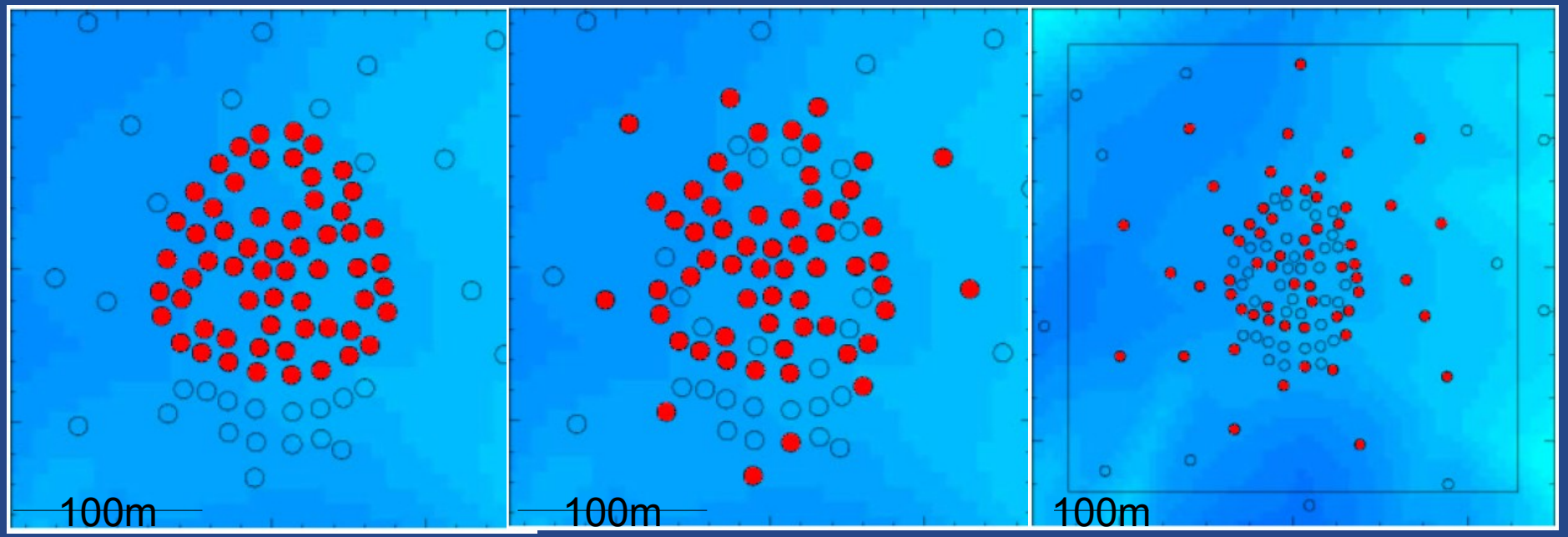
Noise in the image

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

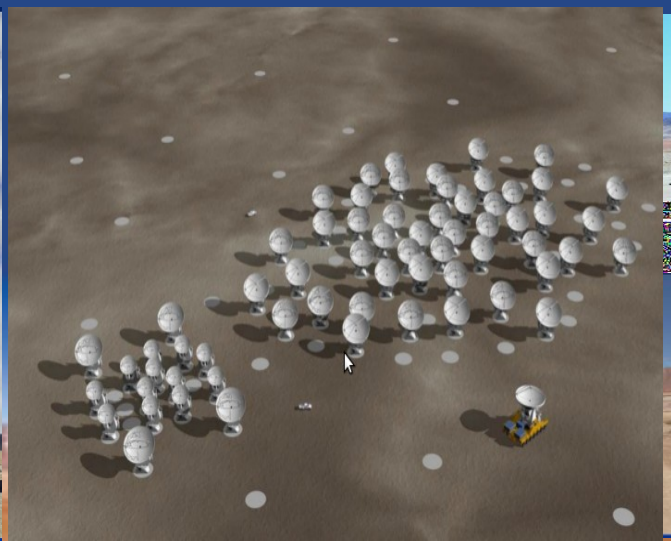
Angular resolution

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

ALMA reconfiguration

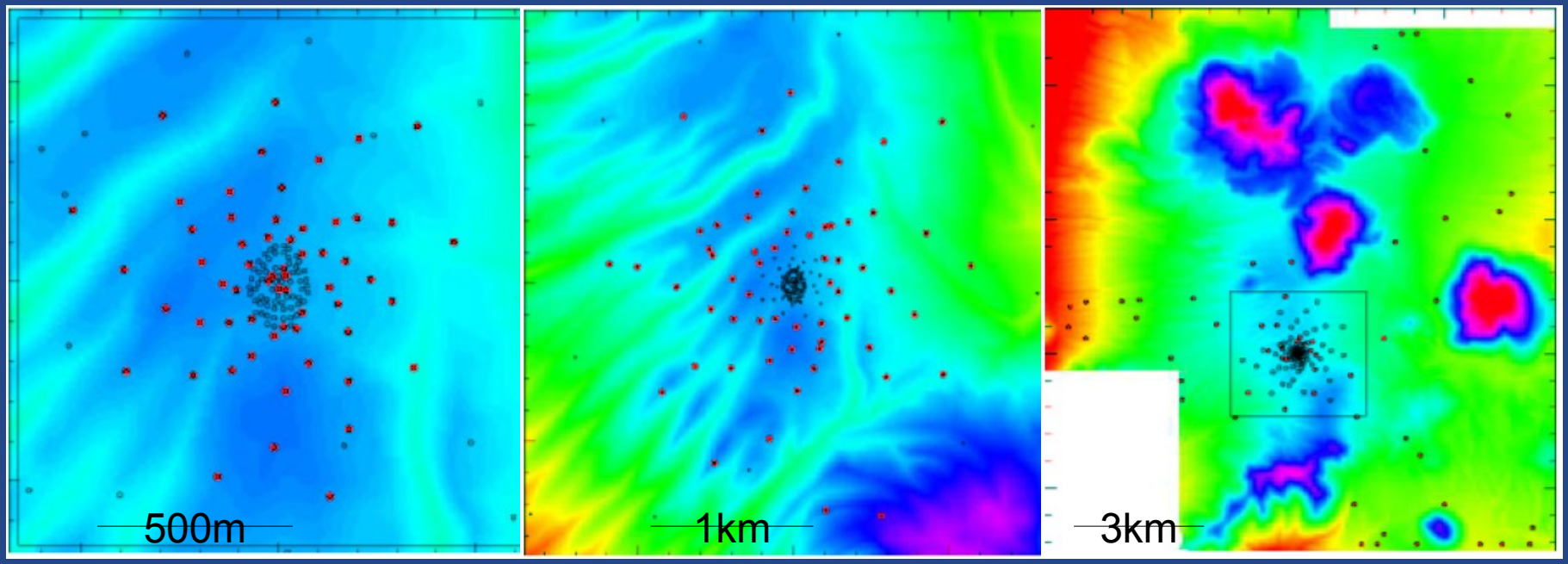


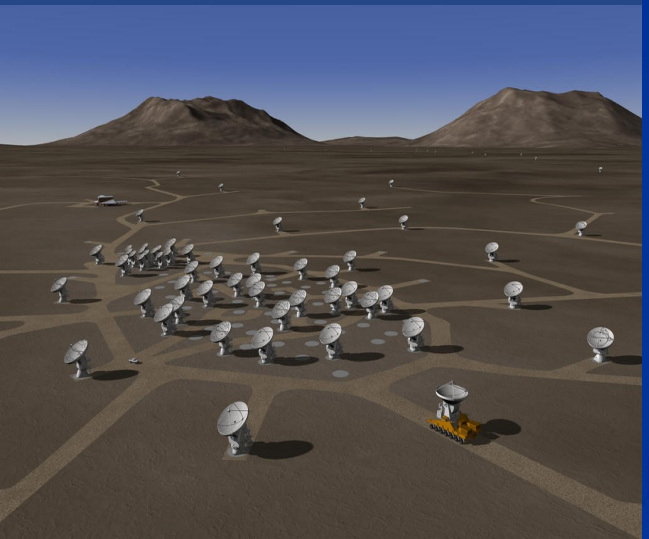
Antenna transporter



Antenna stations at 5000m

ALMA reconfiguration

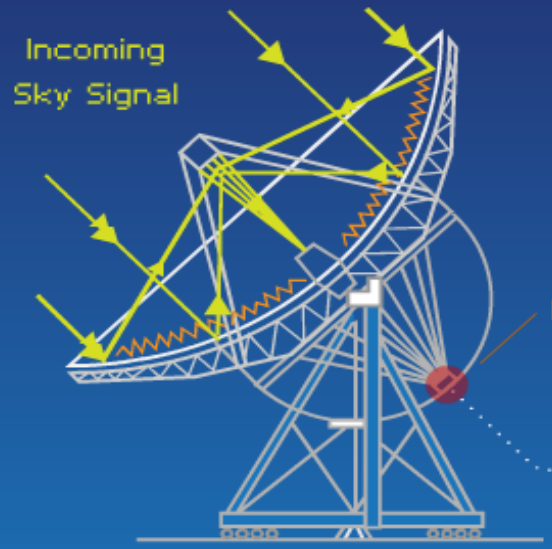




ALMA organization

- 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



Incoming
Sky Signal

Front End

Back End

10101010

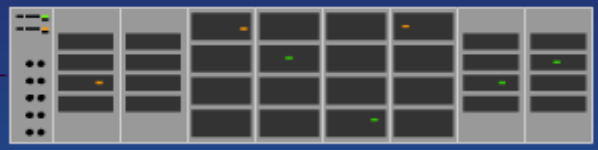
Analog | Digital

ALMA
(66 antennas)

Up to
15 kms
of fiber

Array Operation Site | AOS

Correlator



6.4 - 64
mb/s Link

Operation Suport Facility | OSF

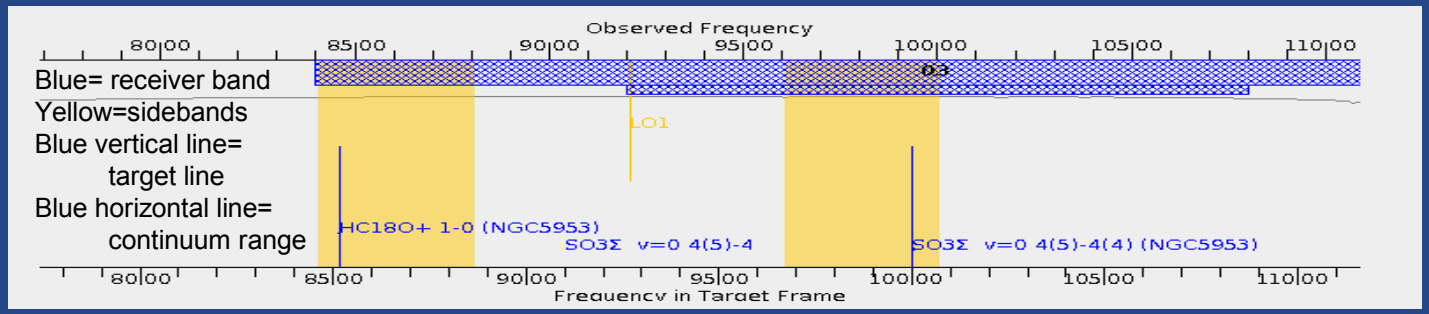
Archive - Operations - Science

ALMA receivers

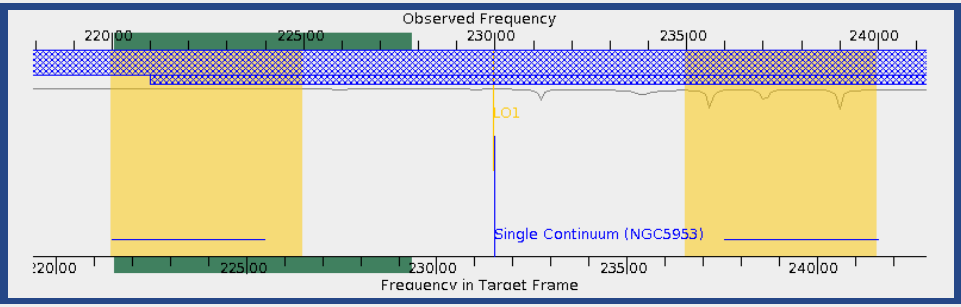
Heterodyne Receiver sensitive to Upper and Lower Side Bands (USB and LSB). Sidebands are mapped to a lower frequency band by mixing the sky signal with a Local Oscillator (LO). Varying LO1 changes the sidebands position.

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

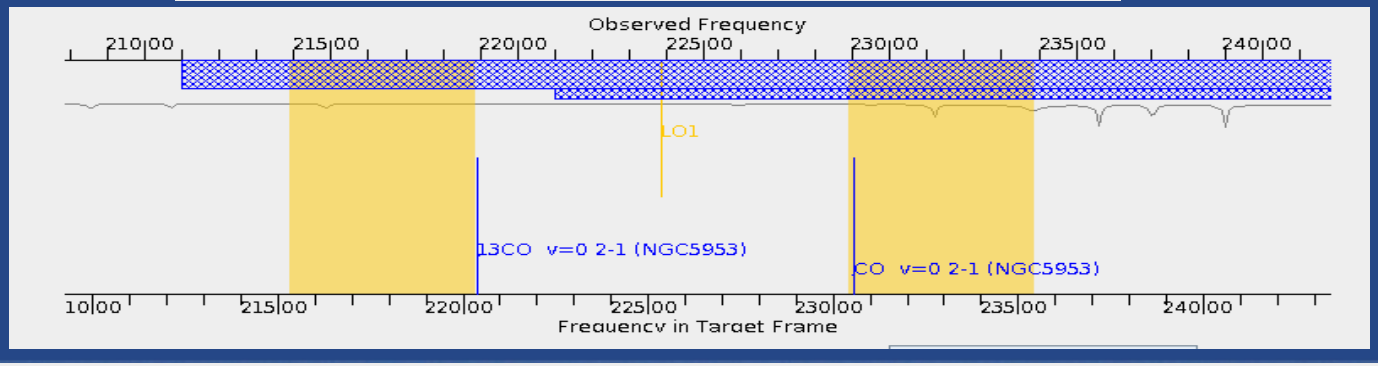
ALMA frequency setup



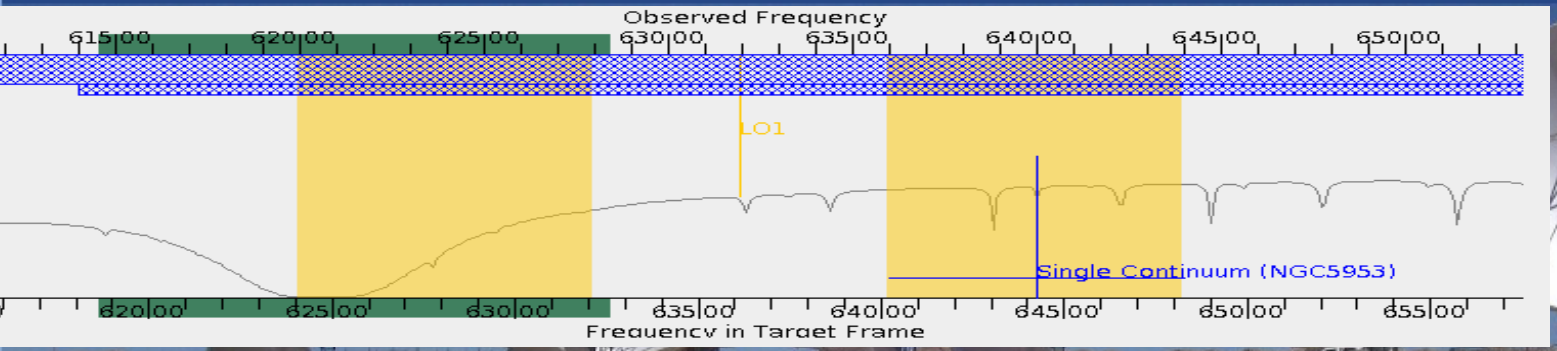
Band 3:
2 sidebands to see target lines



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

8 GHz for each of 2 pol

N antennas

CORRELATOR split in 4 quadrants

1quadrant= 1baseband= 2GHz

1quadrant= 1baseband =2GHz

1quadrant= 1baseband =2GHz

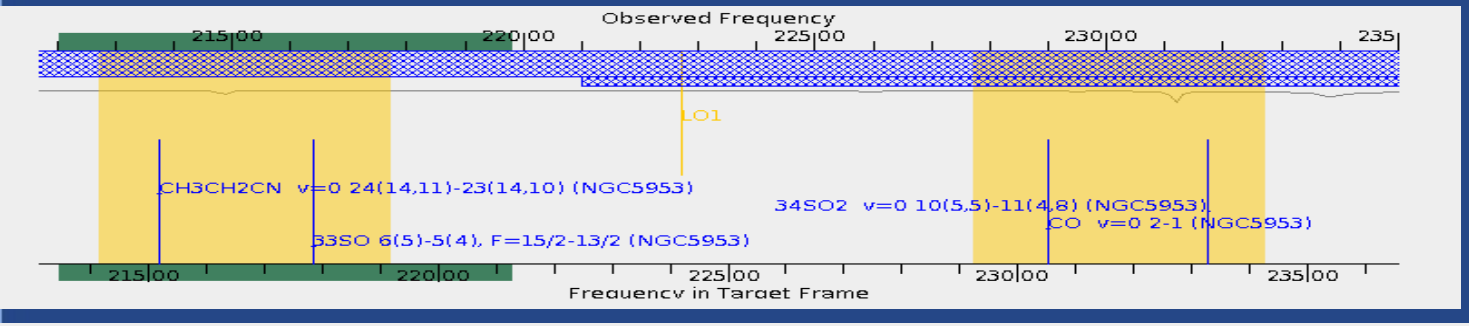
1quadrant= 1baseband =2GHz

OUTPUT from each baseband

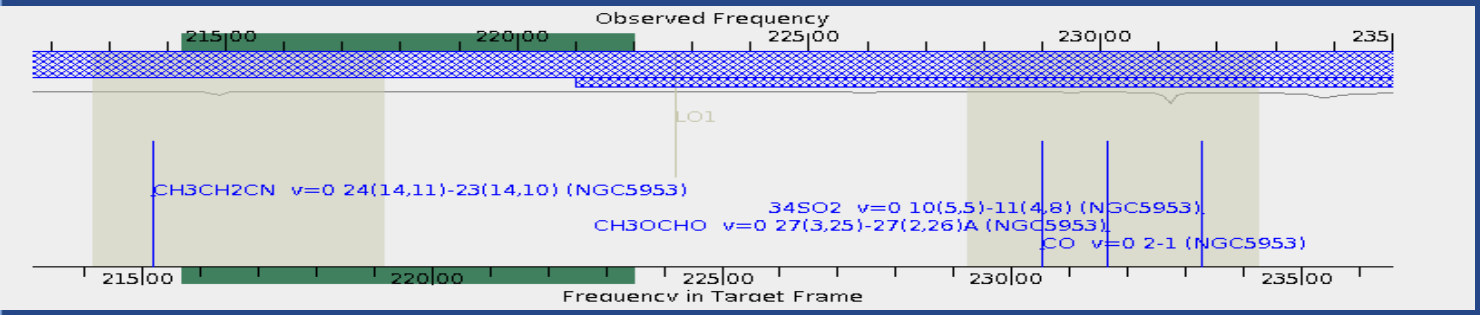
8192 channels
1,2 or 4 polarisations
Spectral window:
31MHz-2GHz

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

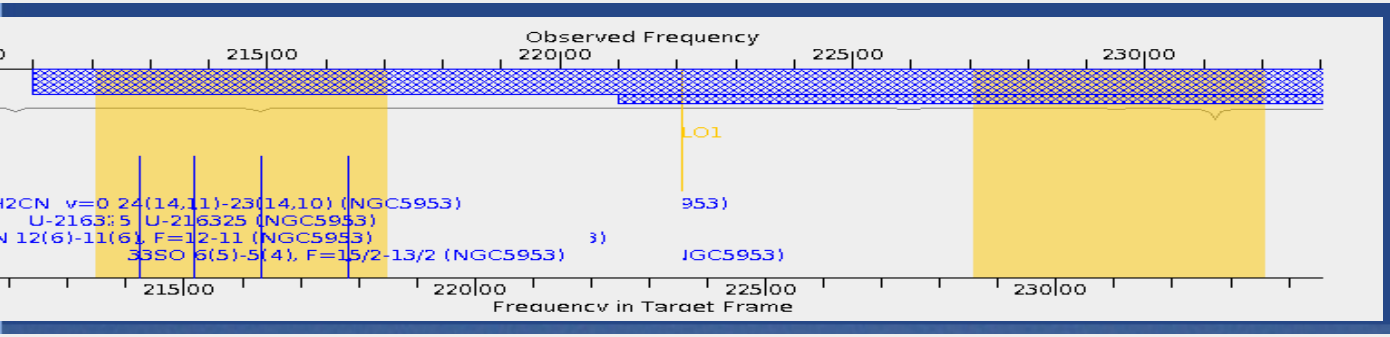
ALMA spectral windows setup



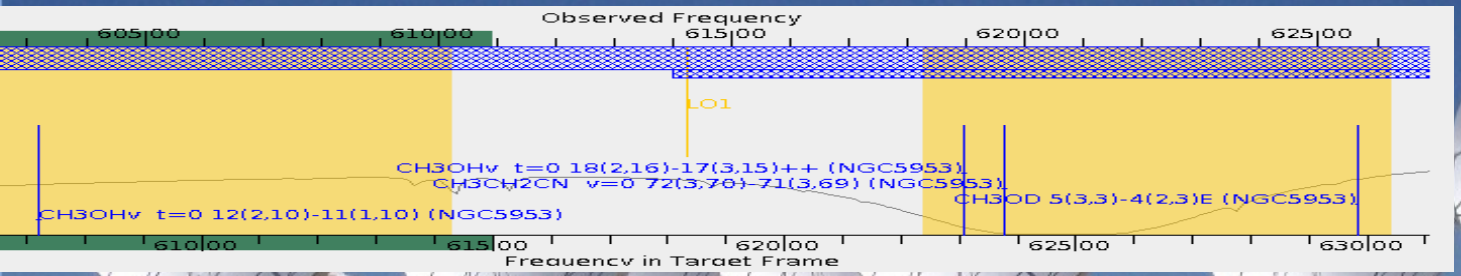
2SB:
2 basebands per sideband



2SB:
3 basebands per sideband
NOT ALLOWED



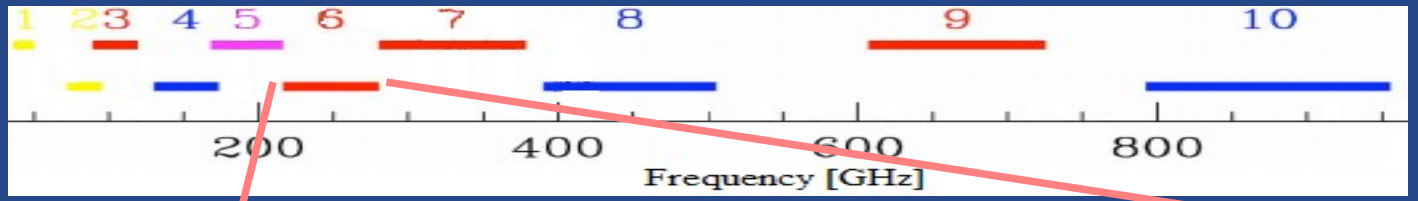
2SB:
4 basebands per sideband



DSB:
3 basebands per sideband
ALLOWED

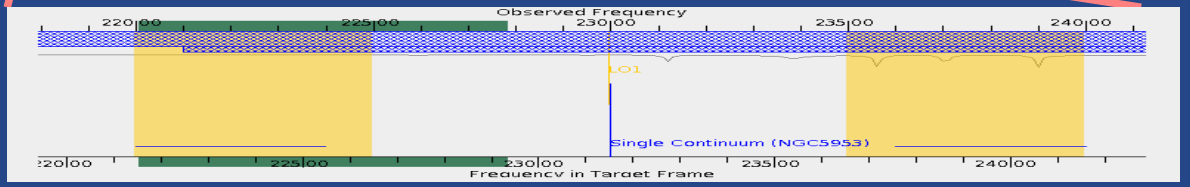
ALMA frequency settings summary

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

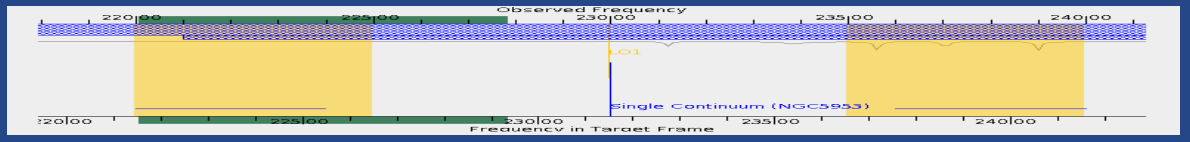


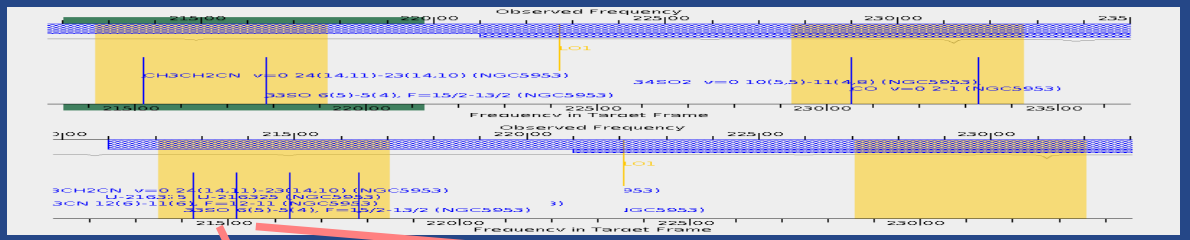
RECEIVERS

Fix LO1 to define the **2 sidebands**



Fix LO2 to define the 4 **basebands**





CORRELATOR

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

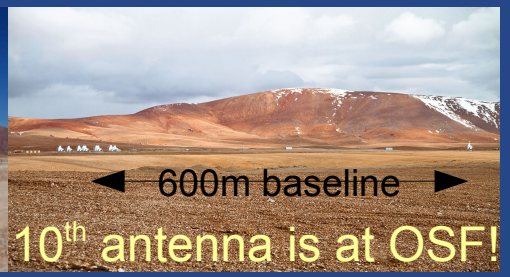
Bandpass calibration

- 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

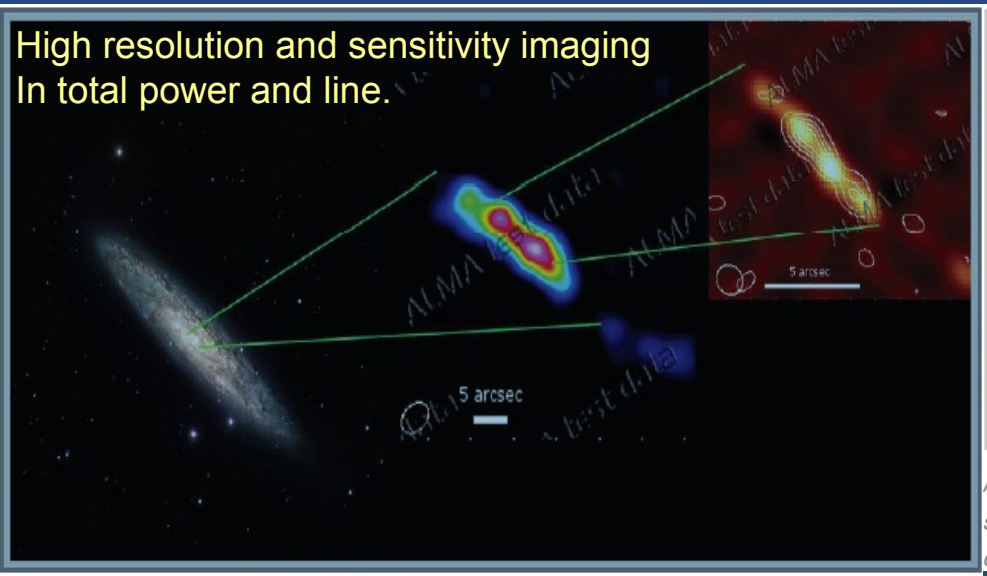
Early Science

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

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

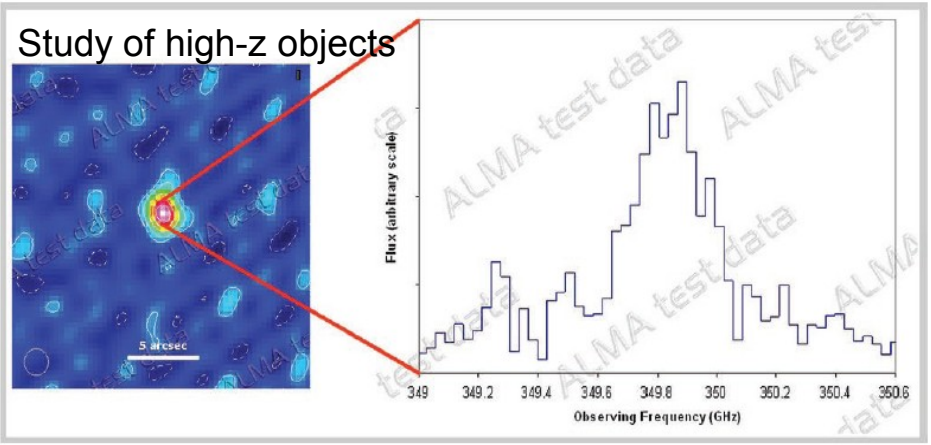
First tests of science with ALMA

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.

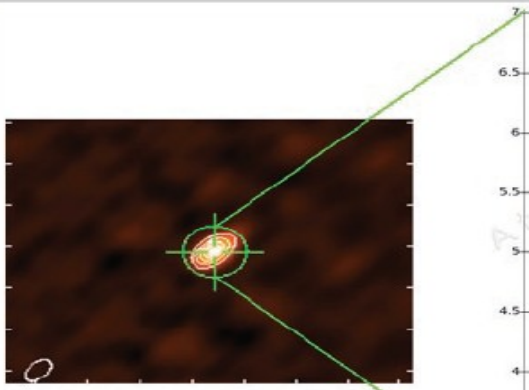
Study of high-z objects



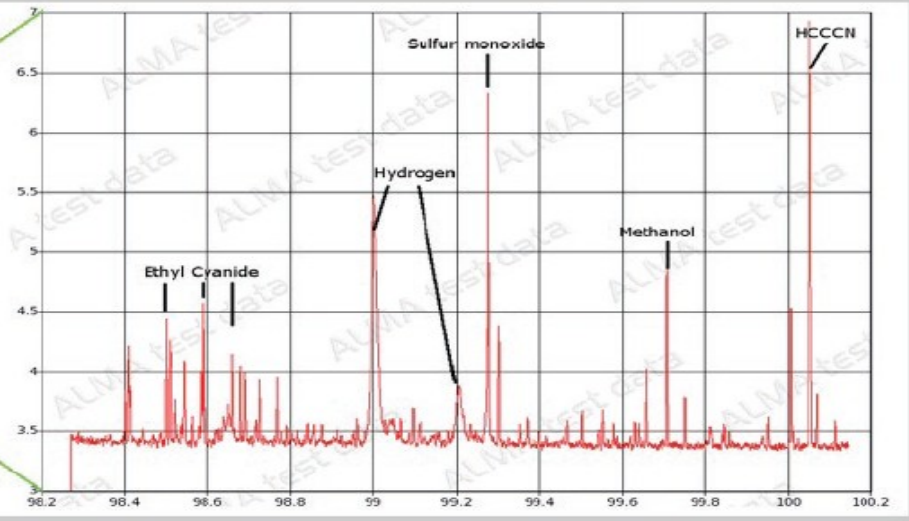
As a test of ALMA's ability to observe broad spectral lines, we observed the quasar BRI 0952-0115, which is at a redshift of z = 4.43. The object is again unresolved on short baselines, but the 158 micron line from ionized carbon is clearly detected in the spectrum, which is impressive given that this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

ALMA 8 antennas hw/sw tests mid 2010

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.

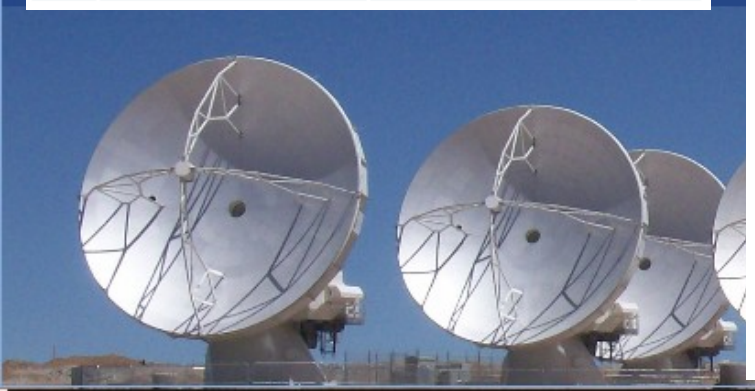


High resolution spectroscopy



	Full array	Early Science
Frequency range:	**10 bands 30-900 GHz**	**4 bands (3, 6, 7, 9)**
Antennas:	**50x12m +** ACA	**16x12m** (no ACA)
Sensitivity	**0.15 mJy in 1 min at 230 GHz**	**0.5 mJy in 1 min at 230 GHz**
Max baseline:	150**m-16km**	**2 configs: 18-125m** **36-400m**
Resolution:	**20 mas @ 230 GHz** **70 correlator modes**	**1000 mas @ 230 GHz** **14 correlator modes**
	Mosaic capability	**Limited mosaic** capabilities
	Pipeline reduction in Chile	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

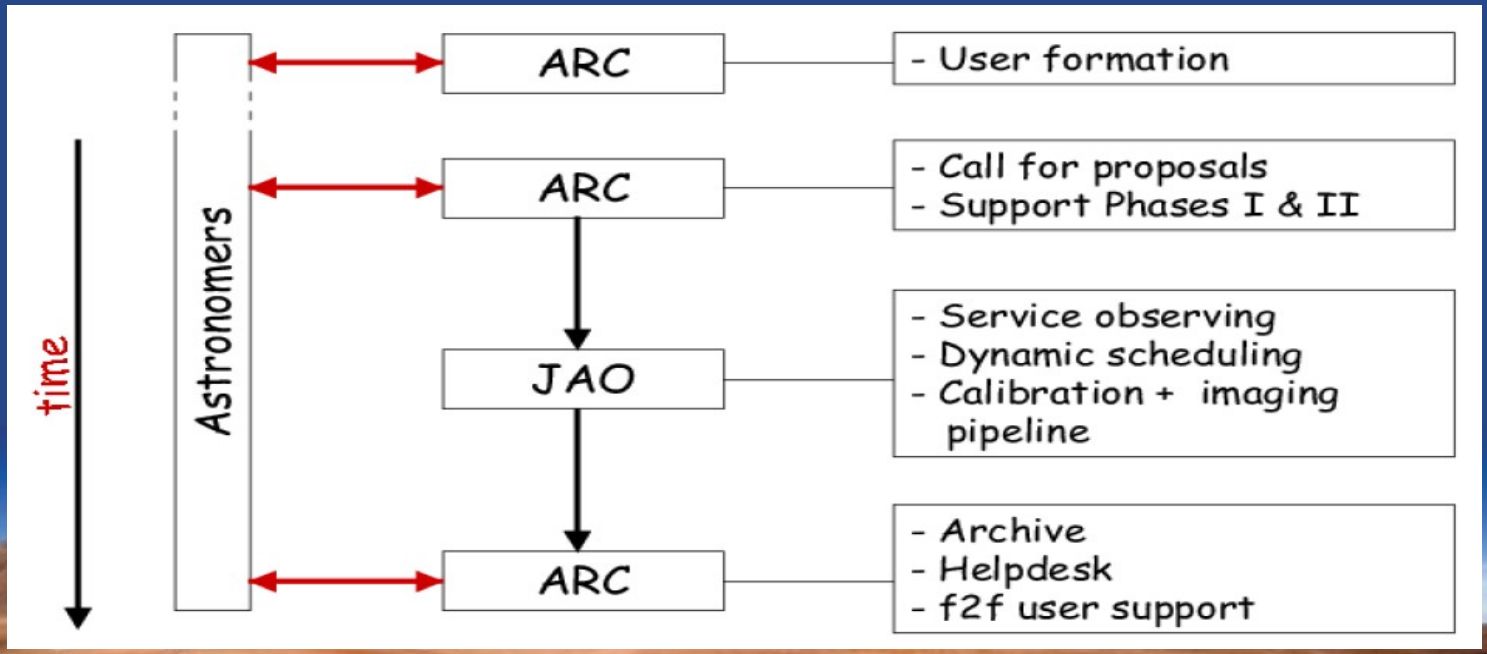
Some tools:
- the Science Portal and the Helpdesk (SP)
- the Observing Tool (OT)
- the Splatalogue
- the Common Astronomy Software Application (CASA)
- the Observation Support Tool (OST)

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/

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	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 instrume
	Pointing strategy	Single	Selecting single will apply primary
	Start hour angle	0.0	Deviation of start of observation fr
	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 w
Imaging	Imaging weights	Natural	This allows a resolution / sensitivit
	Perform deconvolution?	No (Return dirty image)	Apply the CLEAN algorithm to dec

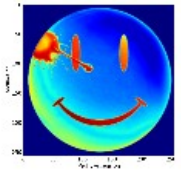
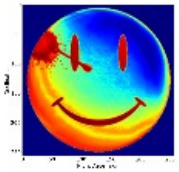
Submit a request for a full simulation of ALMA capabilities for your target

Receive the results via e-mail

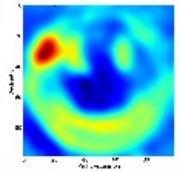
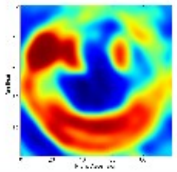
Job ID: 20110330175645 / Submitted by: casasola@ira.inaf.it

Overview

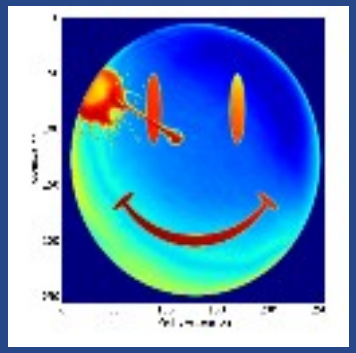
Click thumbnails to view full-size images. Left: linear colour scale, right: with histogram equalization.

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 = 44.15 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)

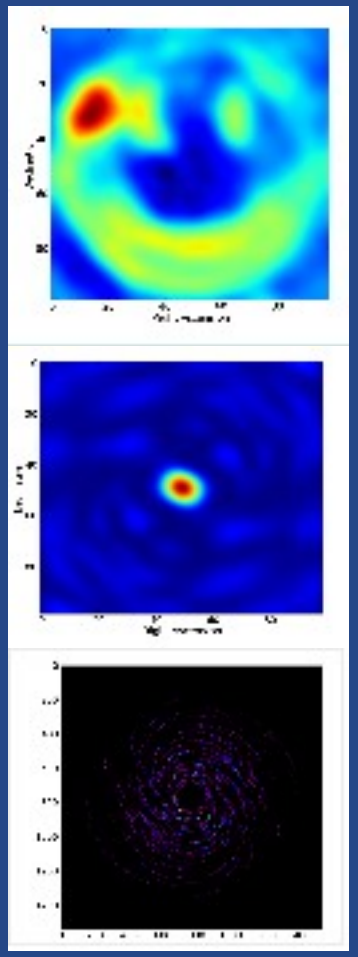


Model

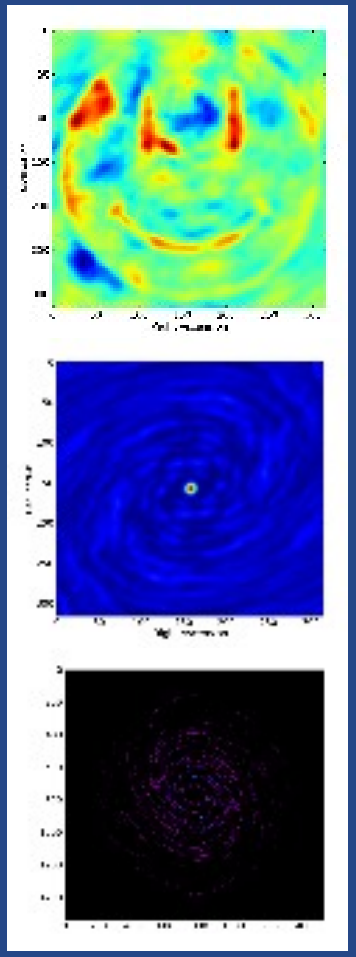
Images

Synthesized beam

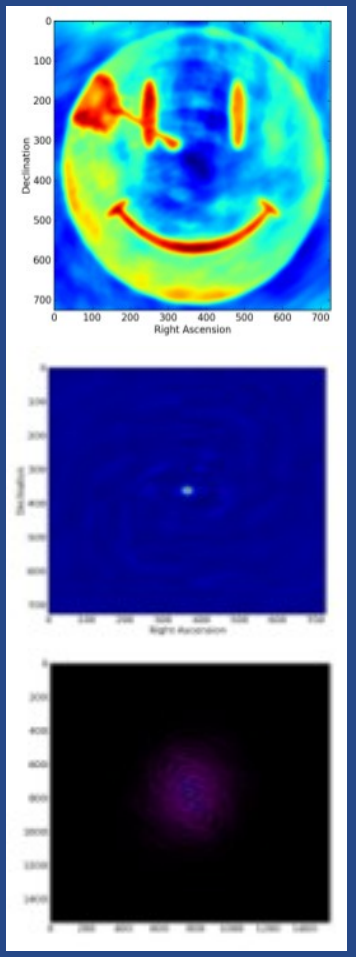
uv coverage



B3 3h
Early Science
Compact config



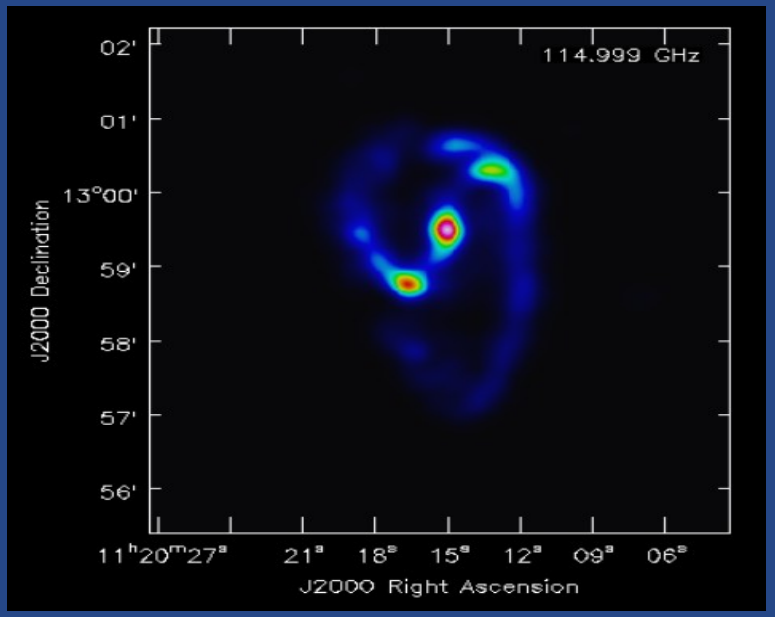
B3 3h
Early Science
Extended config

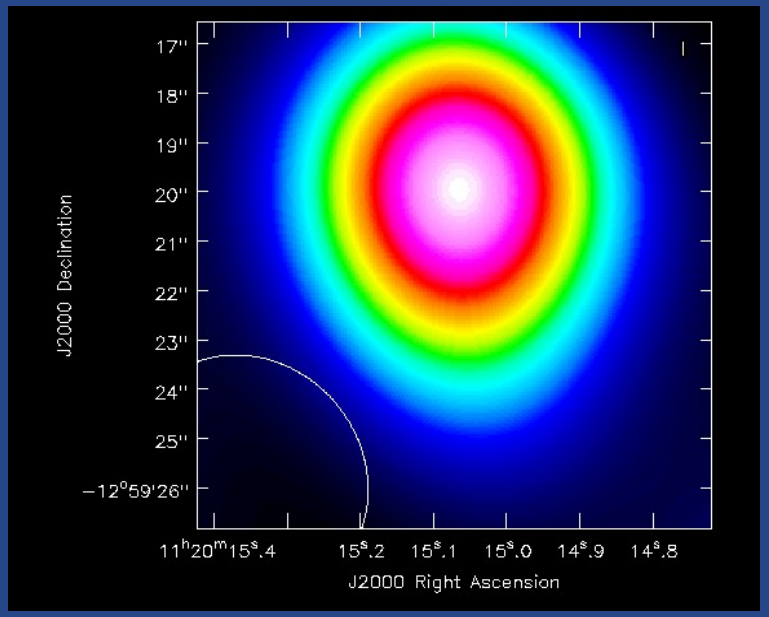


B3 3h
Full ALMA
Compact config

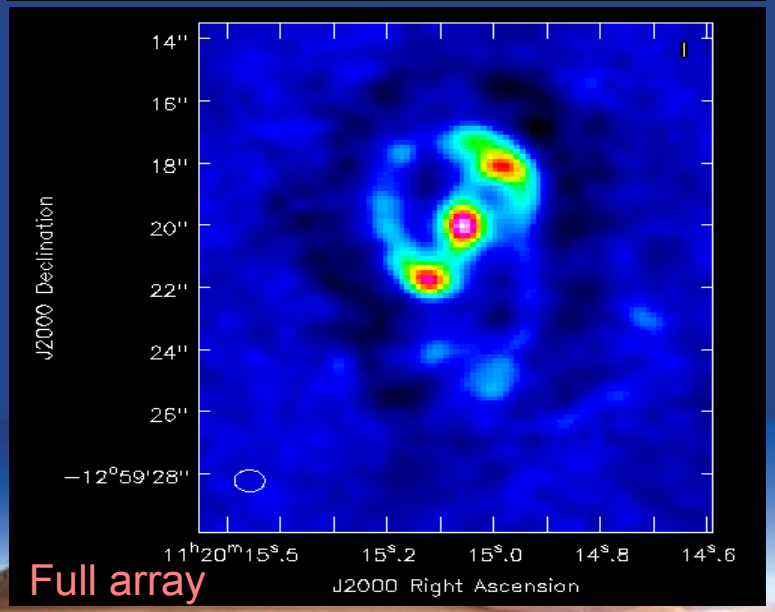
ALMA simulations (CASA simdata)

Simulation of NGC3627 @ z=0.1

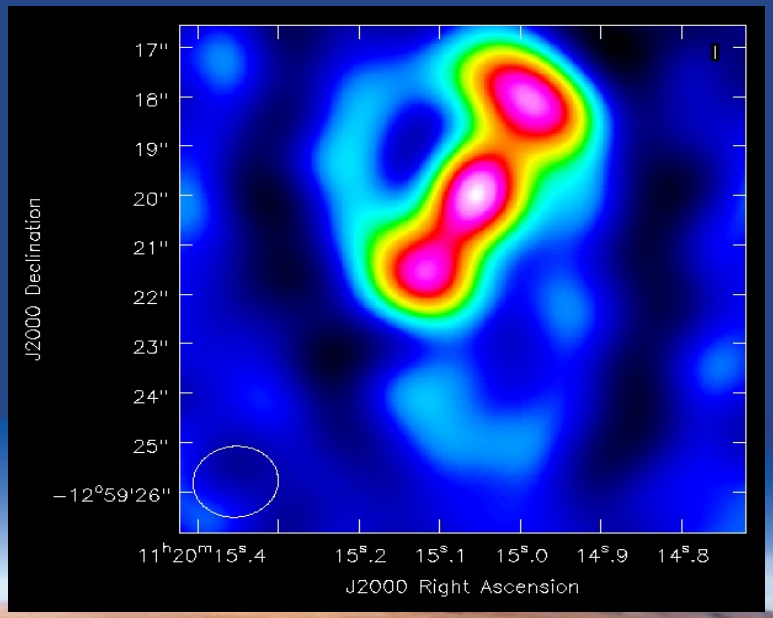




Early Science
Baseline 250m



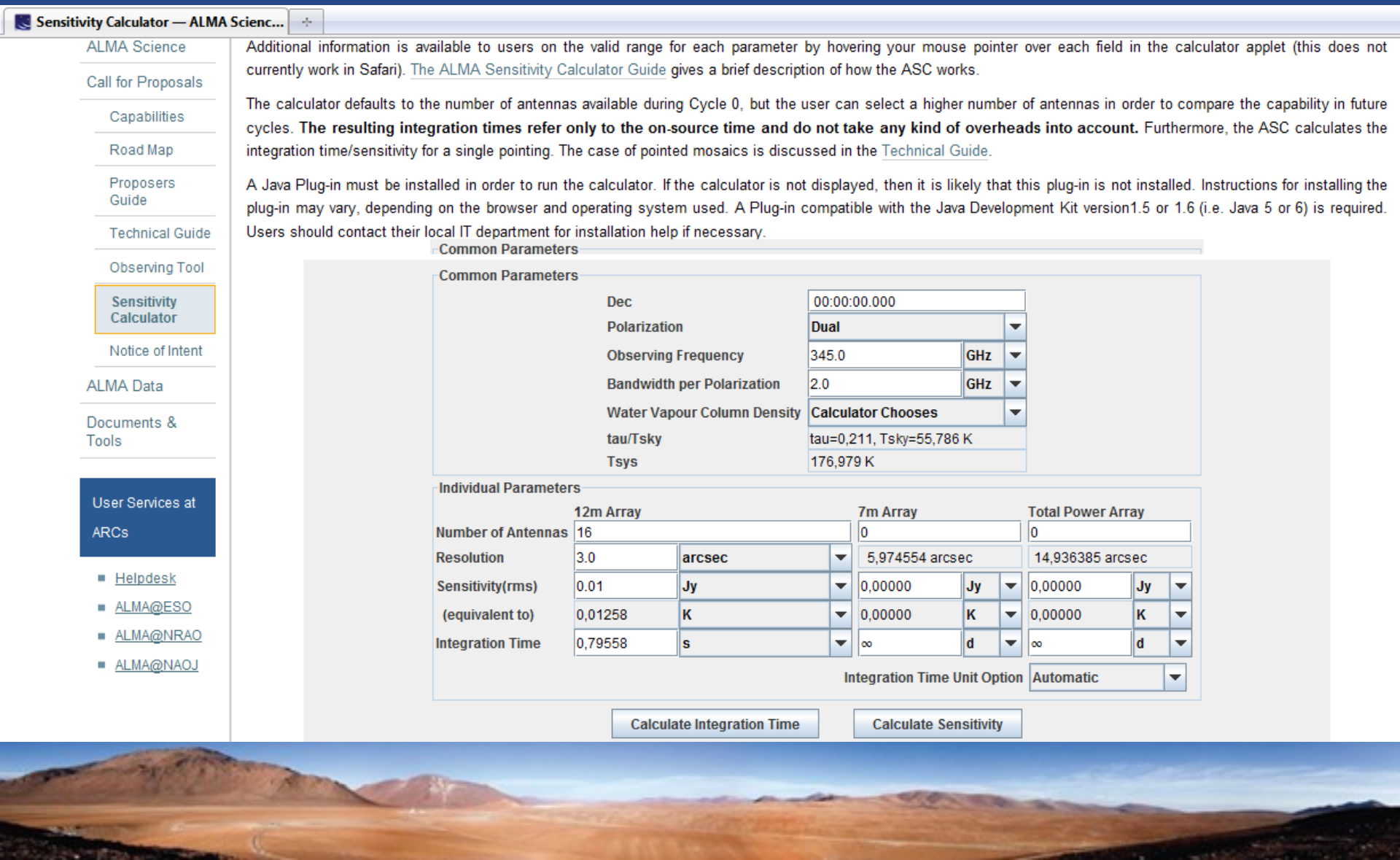
Full array



Early Science
Baseline 450m

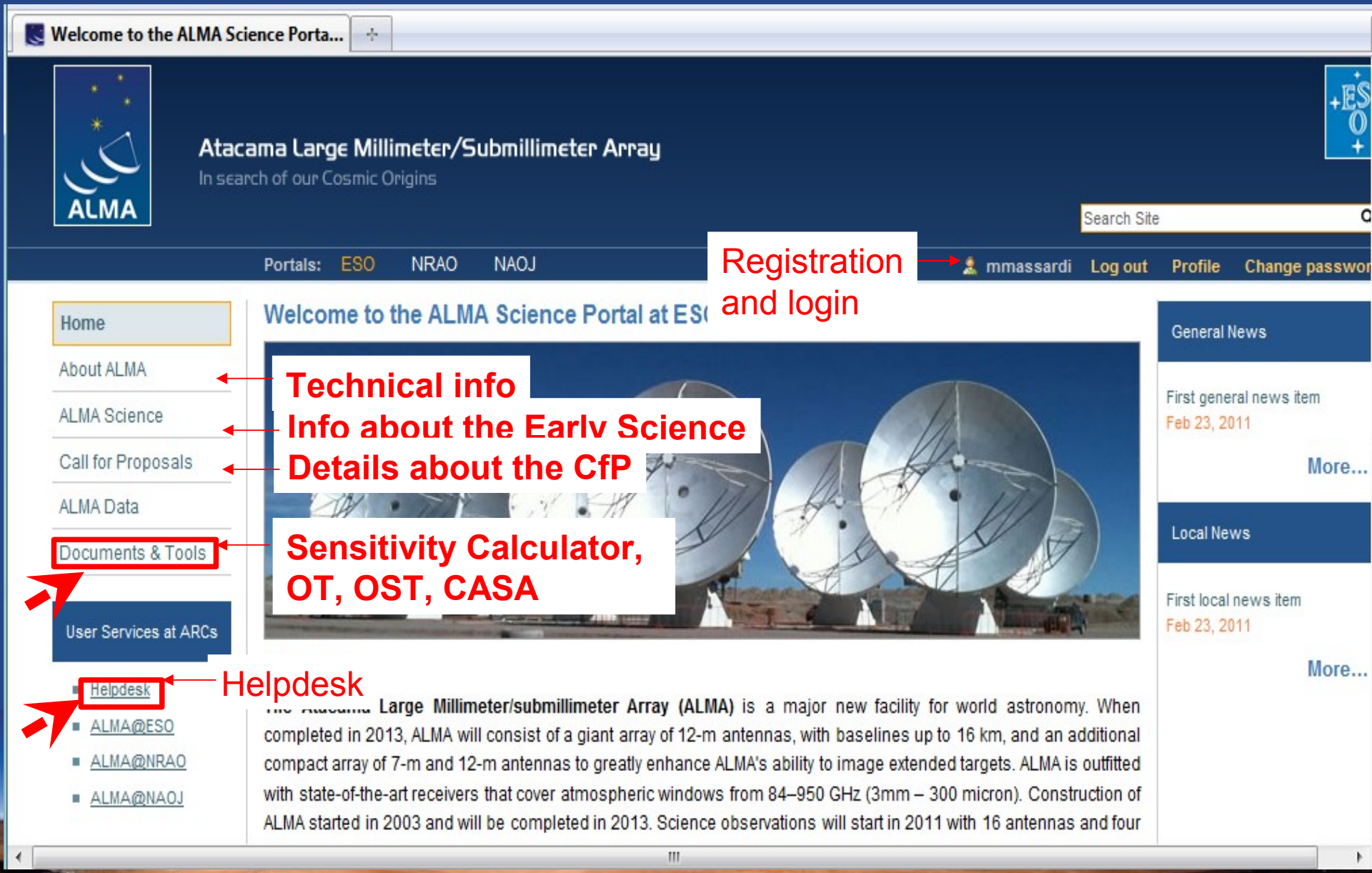
The Science Goal: Sensitivity Calculator

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

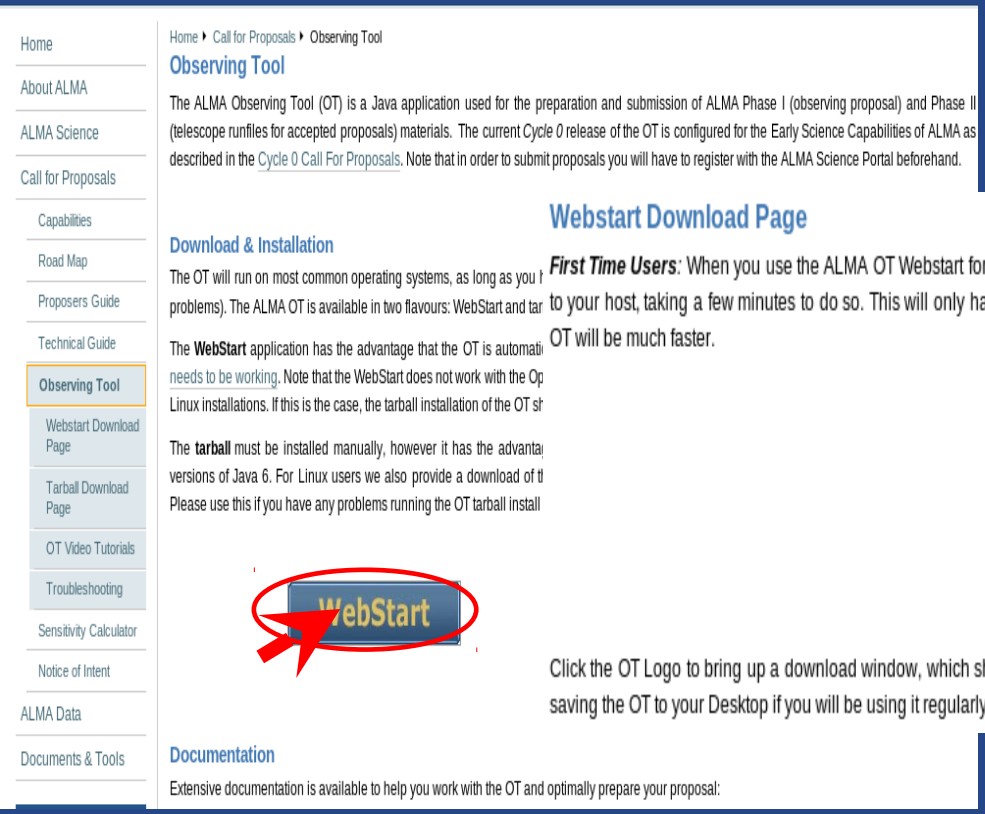


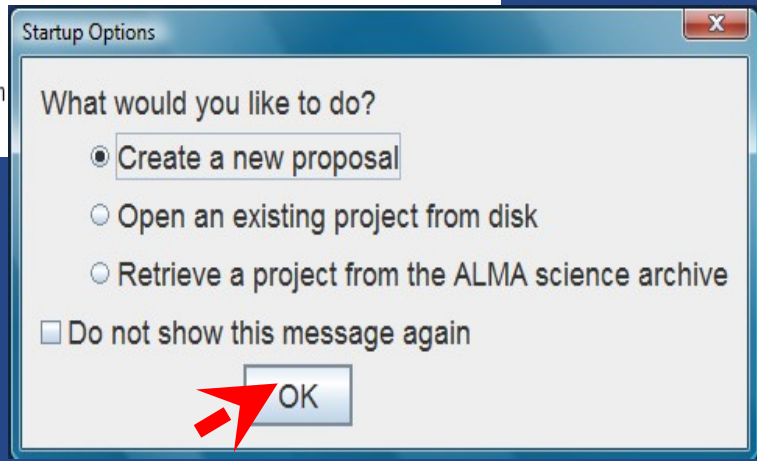
The ALMA Science Portal

http://almascience.org/



The ALMA Observing Tool

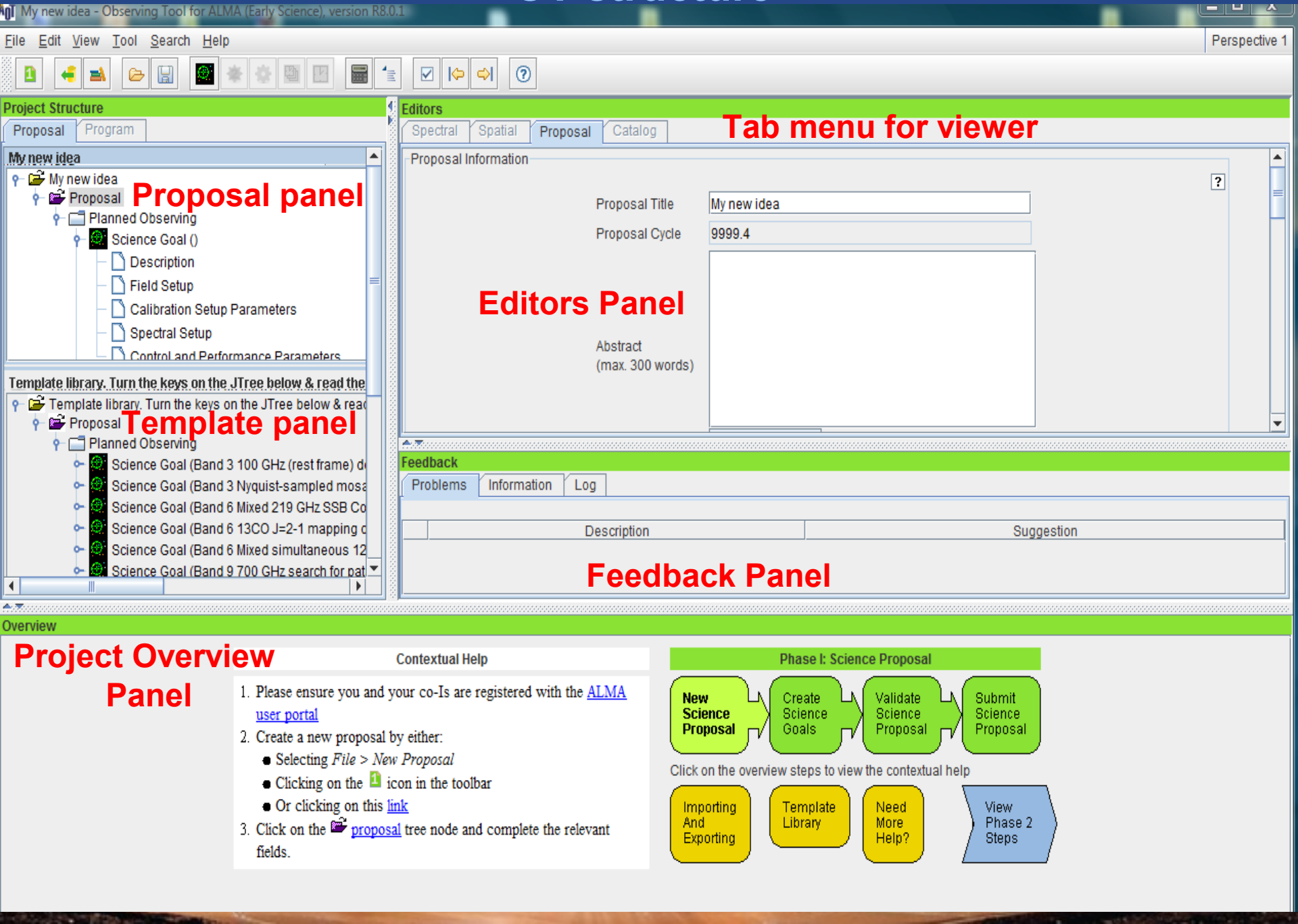




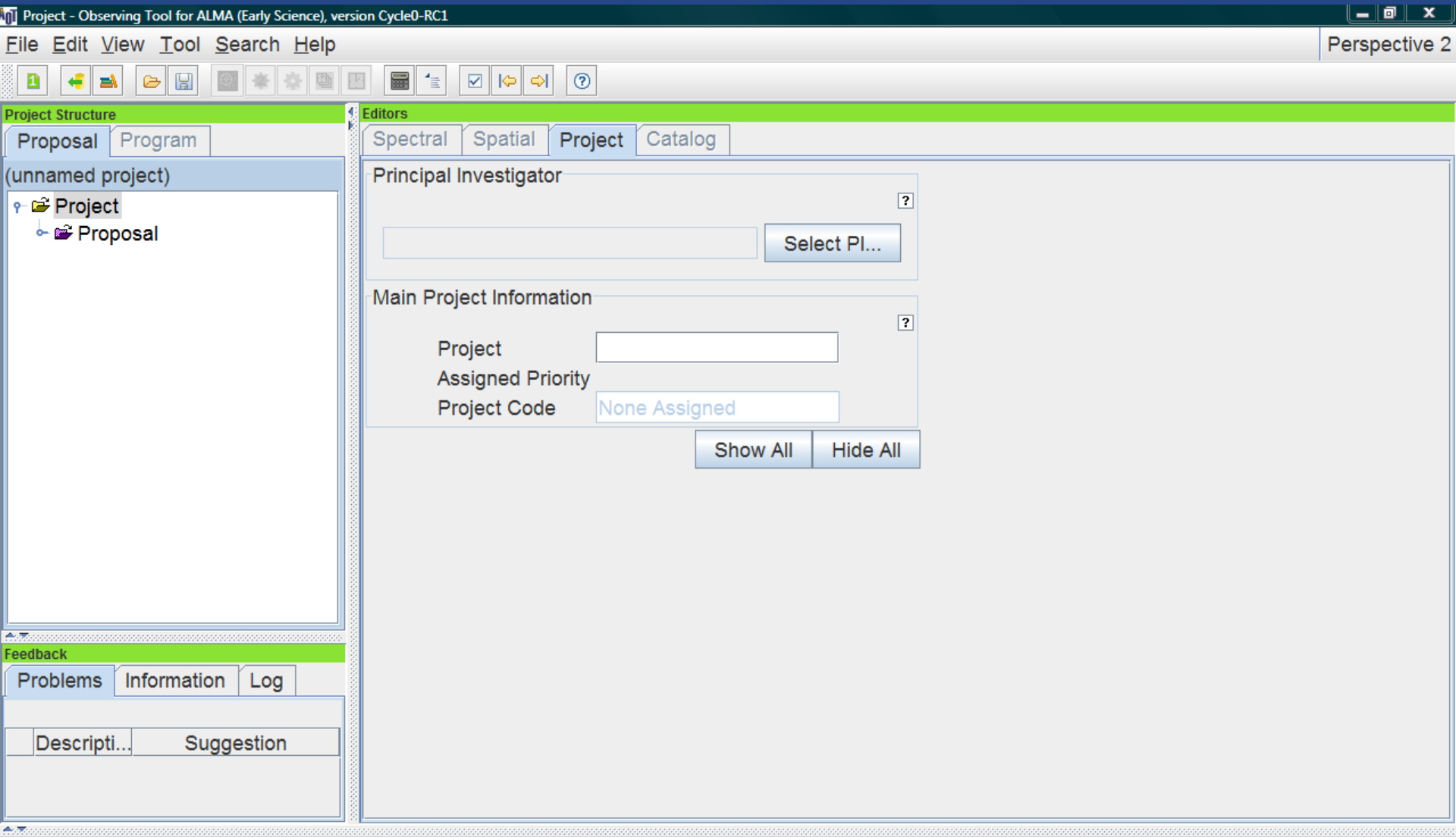
OT is a java-based client program,
requires Java 1.6 (currently), runs on Linux (various distr.), MacOS (10.5-10.6), Windows (>XP).

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

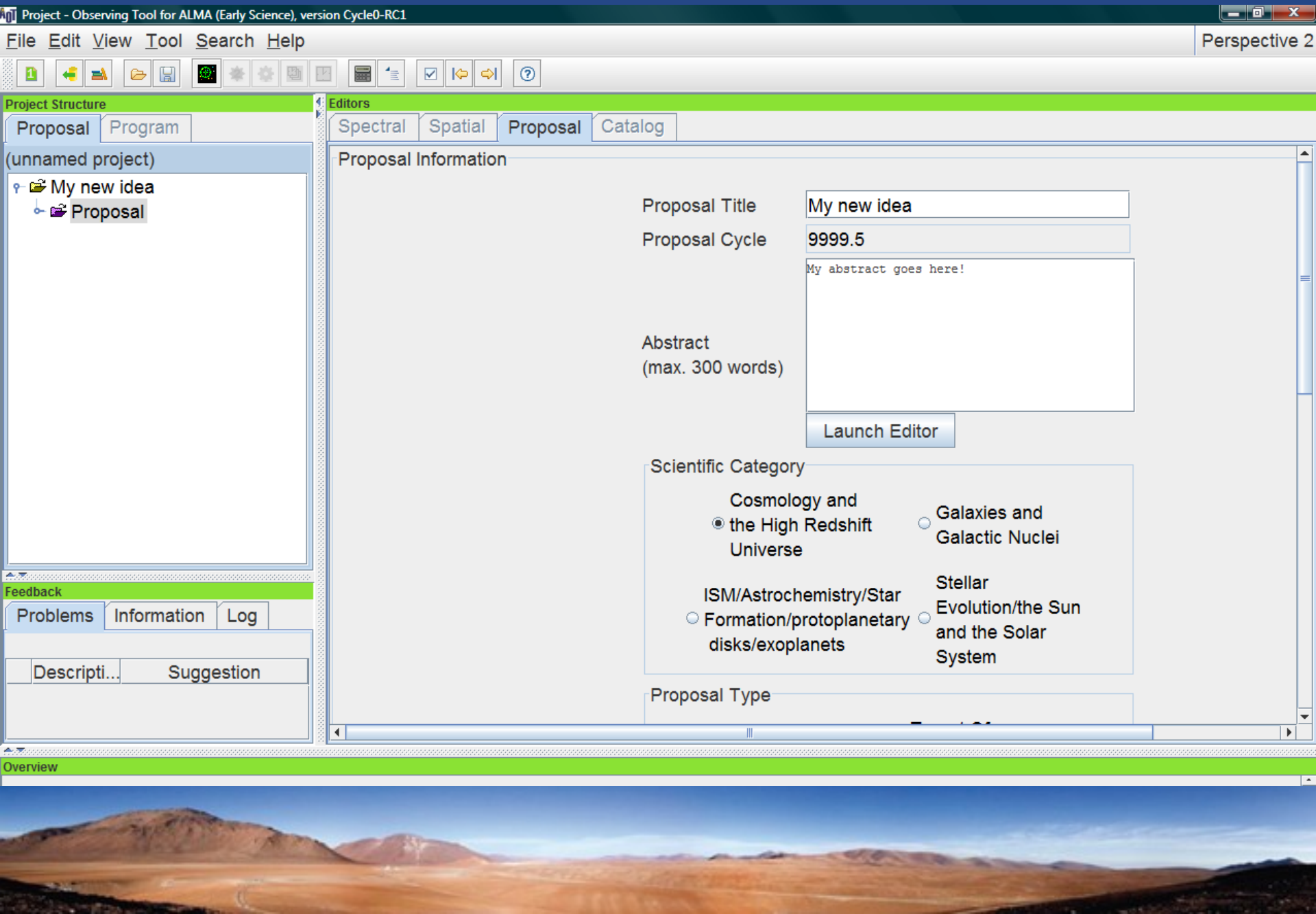
OT structure



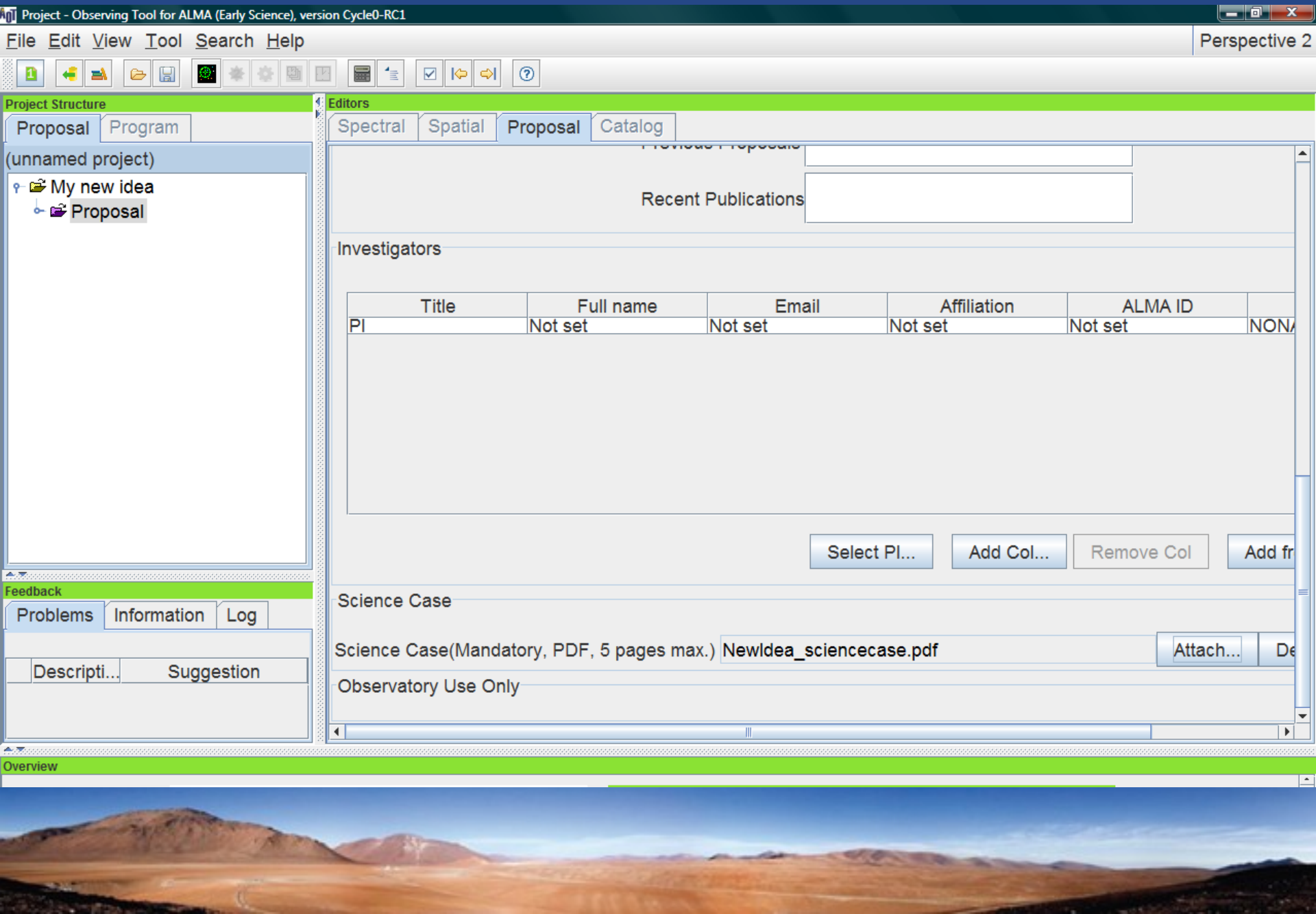
The project properties



The project properties

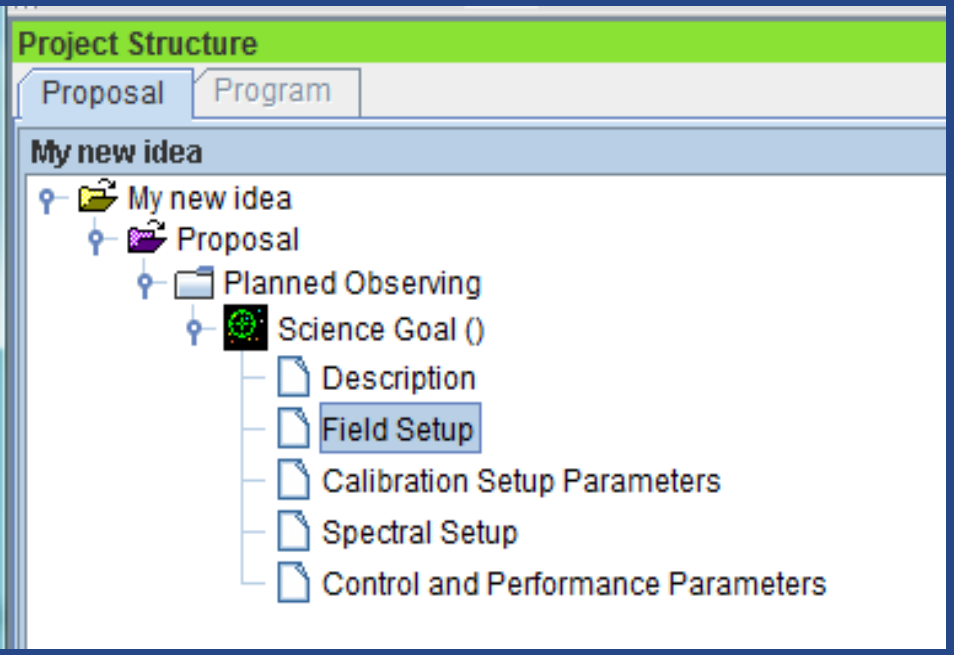


The project properties



The Science Goal concept

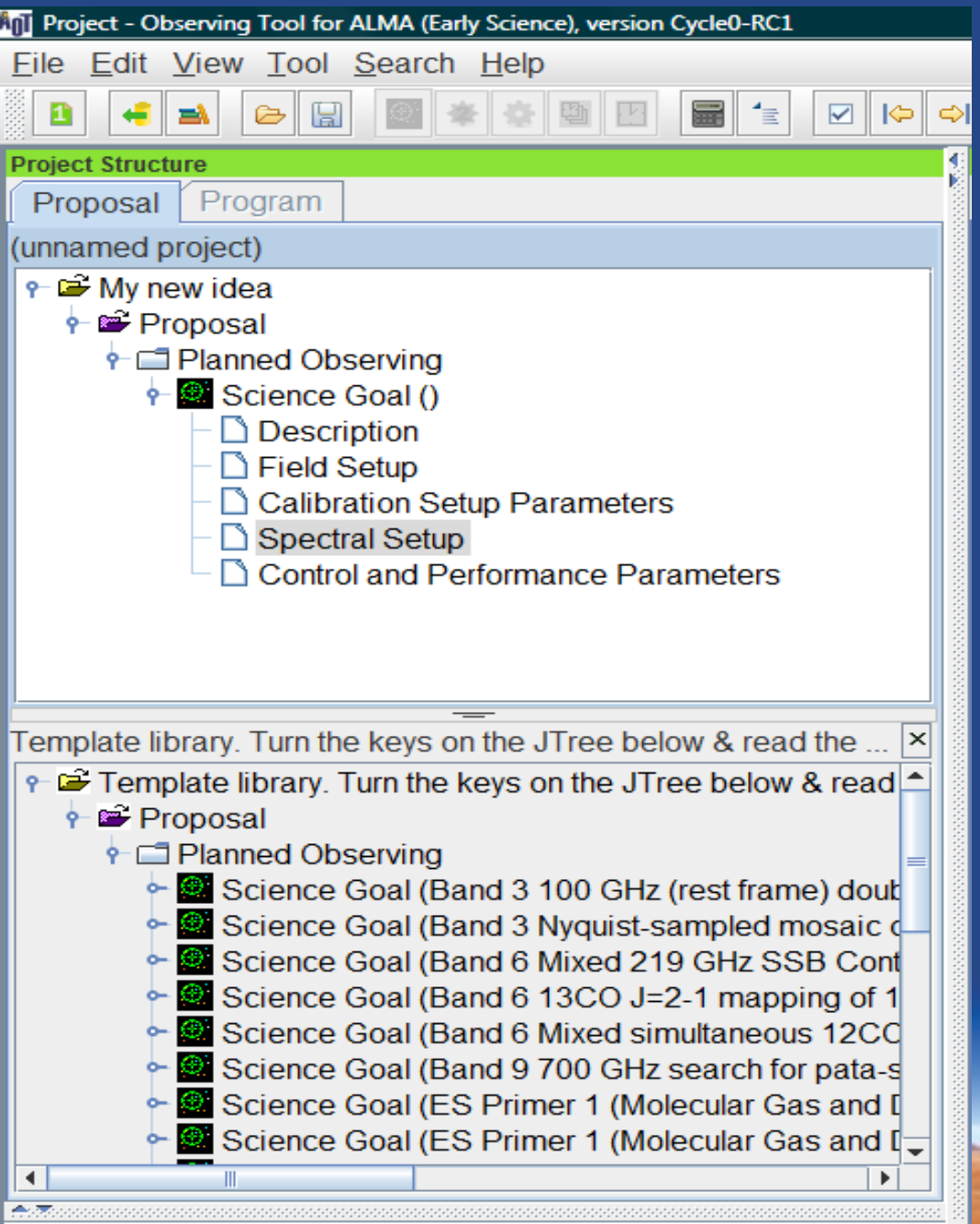
The OT divides the observing info of a project into "**Science Goals**"



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



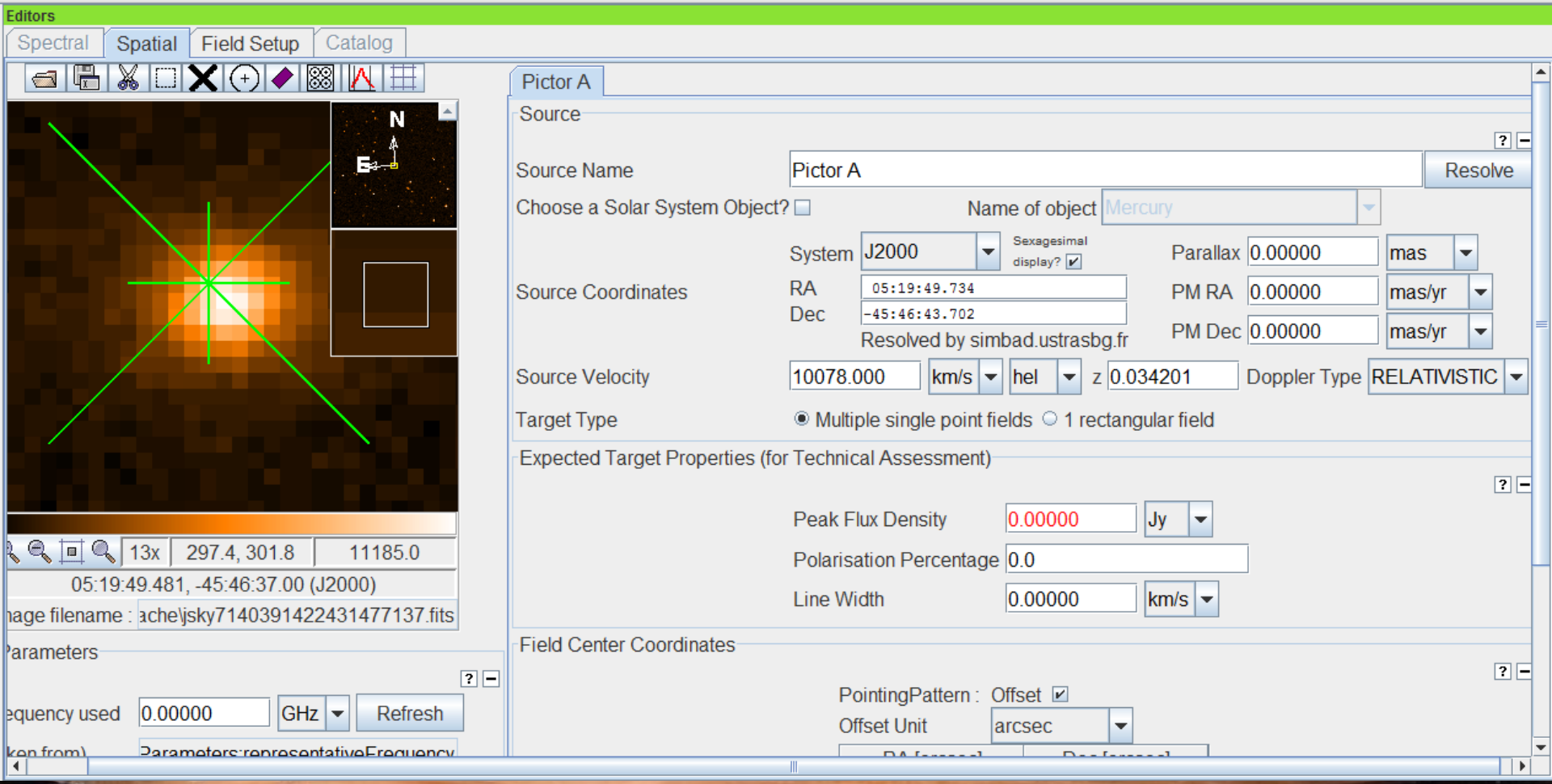
A selection of hot science topics for science goal templates is on-board the OT

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

The Target setup

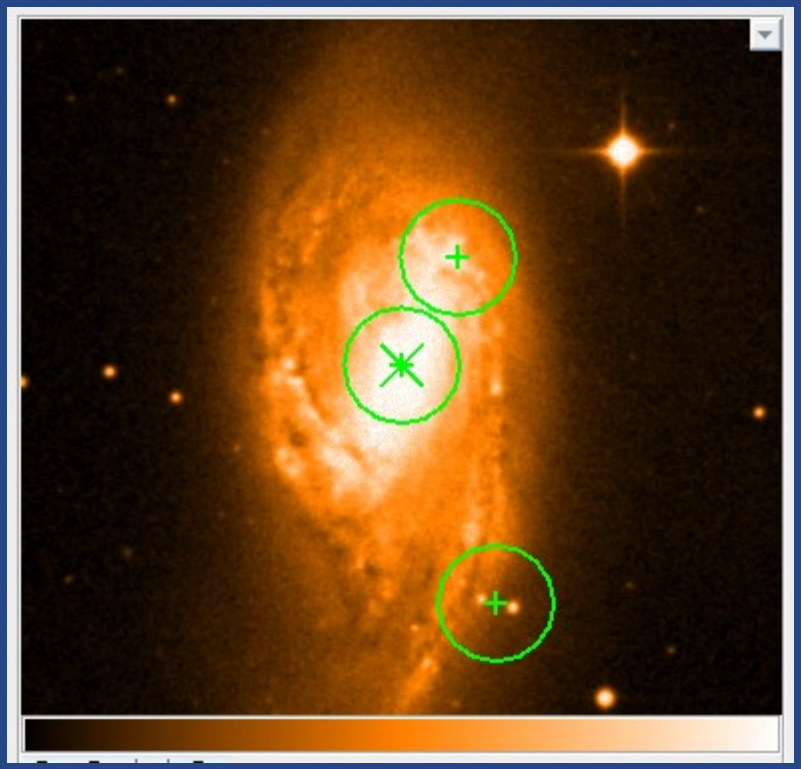
The Spatial visualizer

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

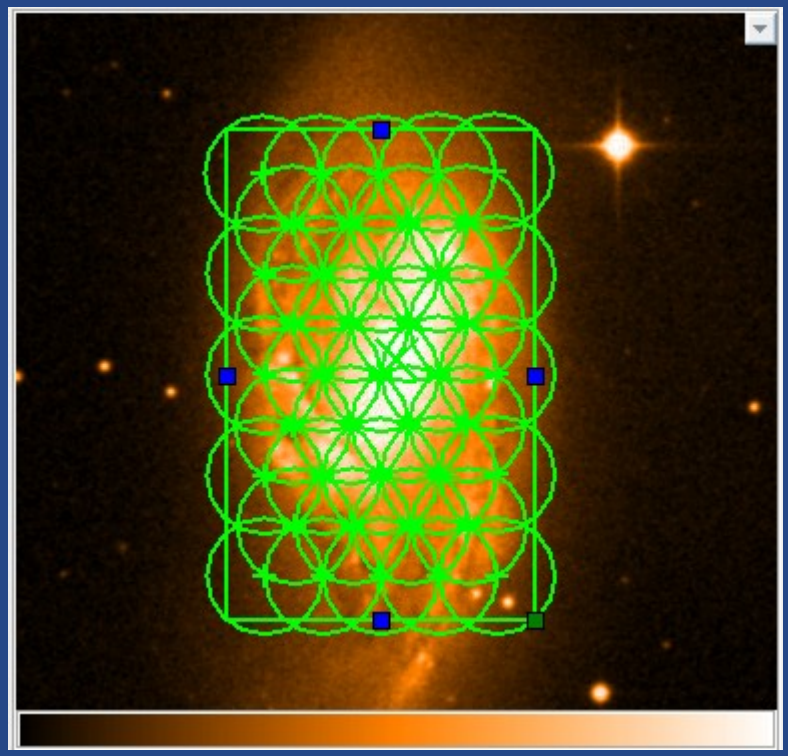


Mosaicking

Single field pointings



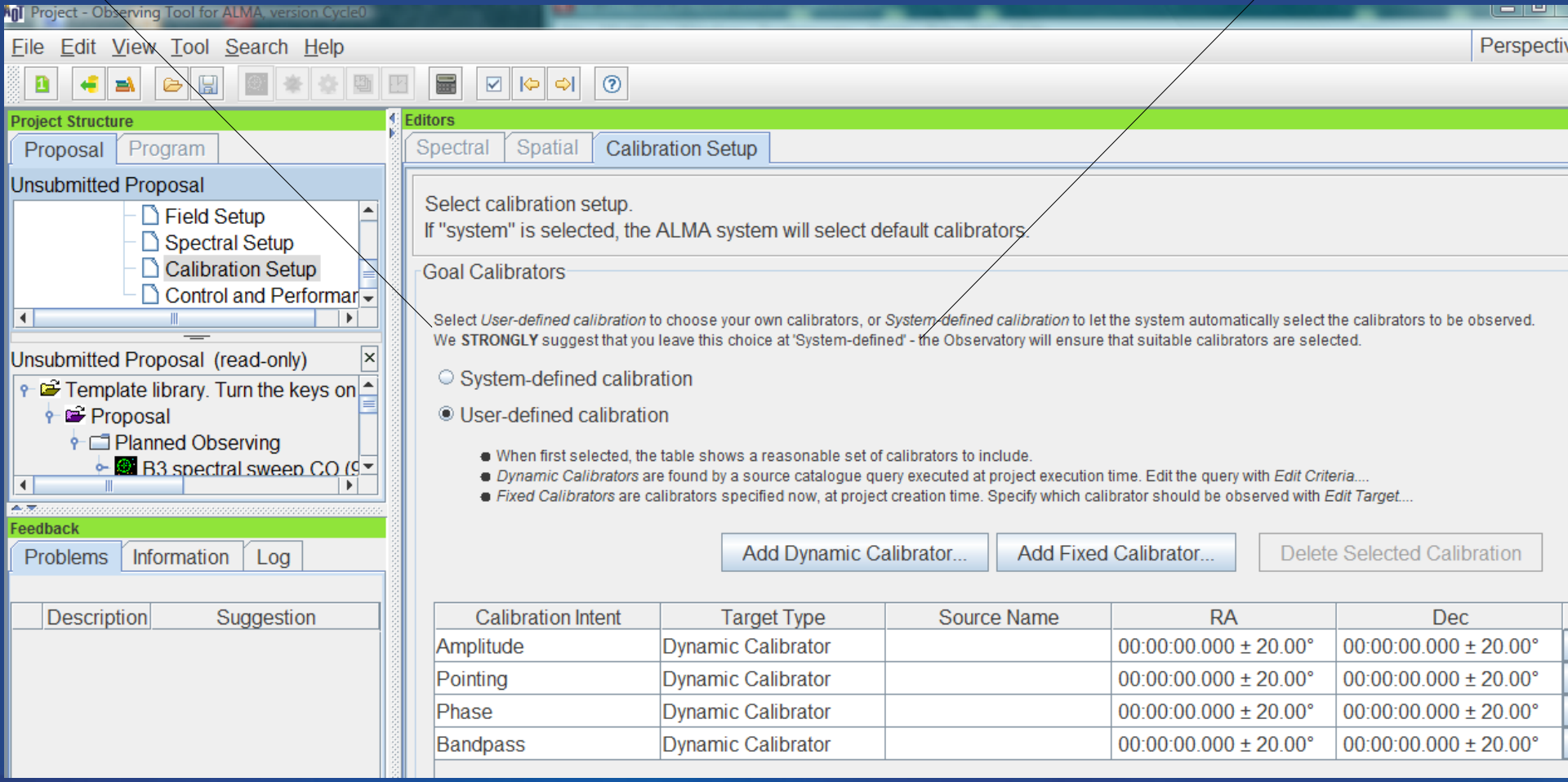
Mosaic (up to 50 pointings in ES!)



The Calibration setup in the observing tool

"...We STRONGLY suggest that you leave this choice at 'System-defined'..."

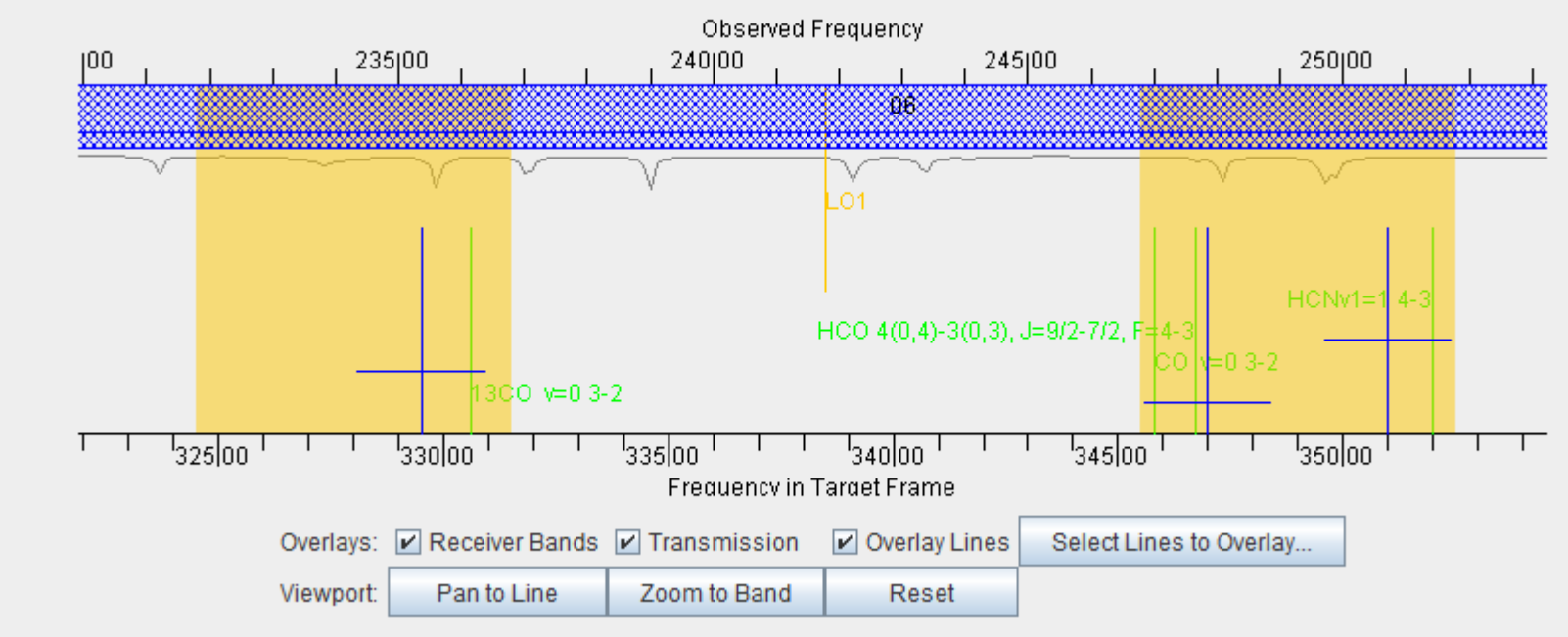
at least for the ES Phase 0

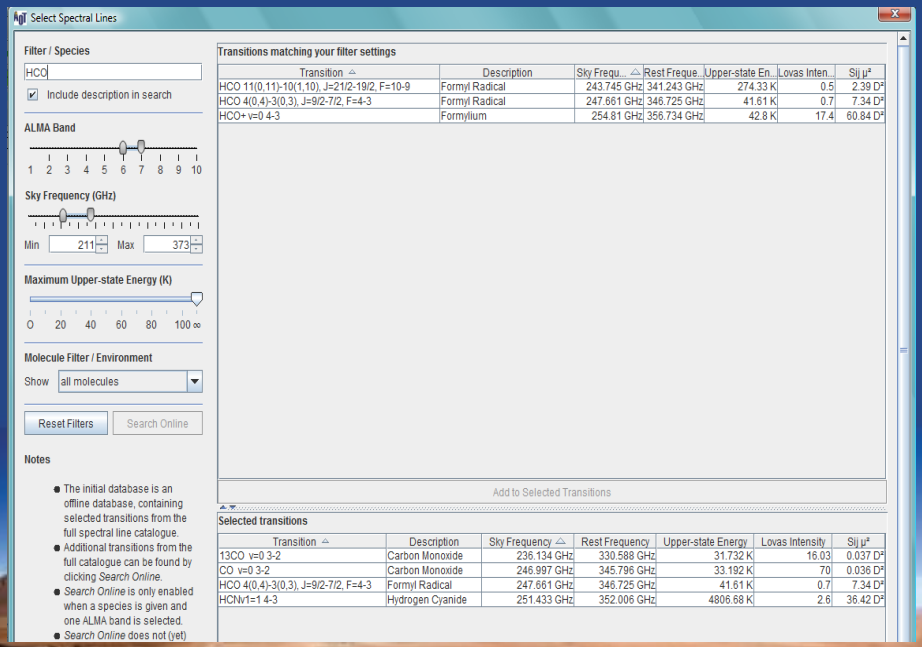


If user-defined calibration is necessary, care to justify it in the proposal!!!

The Spectral properties

The Spectral visualizer





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

The control and performances panel

The Science Goal: Summary & tools

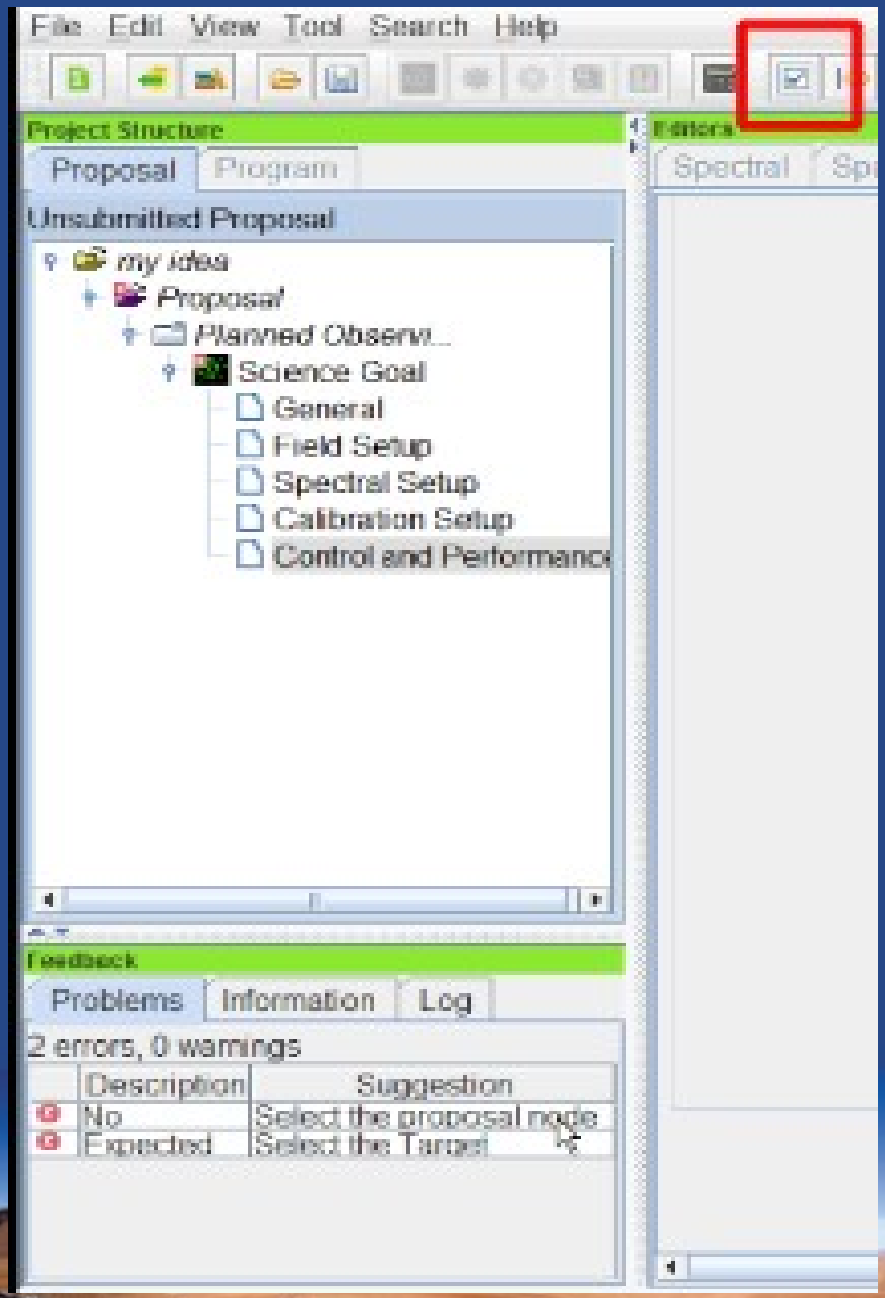
Field setup: Add as many targets as you want, in the same sky region
OT resolves for known objects
User ephemeris for moving bodies (comets, asteroids, TNOs)
Access online surveys for imaging
Use the interactive panel to draw on the image of your region
(or to define your mosaic)

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 NAME:	Marcella Massardi	PROJECT CODE	None Assigned	
SCIENCE CATEGORY:	Cosmology and the High	ESTIMATED TOTAL TIME:	0,6 h	
CO-PI NAME(S): (Large Proposals only)				
CO-INVESTIGATOR NAME(S):	Viviana Casasola			
EXECUTIVE SHARES[%]	NA: 0 EU: 100 EA: 0 CHILE: 0 NONALMA: 0	STUDENT PROJECT? (Yes/No)	No	
		RESUBMISSION? (Yes/No)	No	

ABSTRACT
Here is my abstract ....

REPRESENTATIVE SCIENCE GOALS (UP TO FIRST 5)					
SCIENCE GOAL	POS.[J2000.0]	FREQUENCY	BAND	ANG.RES.(")	ACA?
ScienceGoal	05:19:49.734, -45:46:43.702	111,45917 GHz	3	3,0	N
Total # Science Goals : 1					

SCHEDULING TIME CONSTRAINTS (e.g. Co-ordinated observations already scheduled)
NONE

PI CONTACT INFORMATION			
TITLE:		INSTITUTE&/ORDEPT.:	N/A
NAME:	Marcella Massardi	ALMA EXECUTIVE:	EU
E-MAIL:	marcella.massardi@oapd.inaf.it		
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.

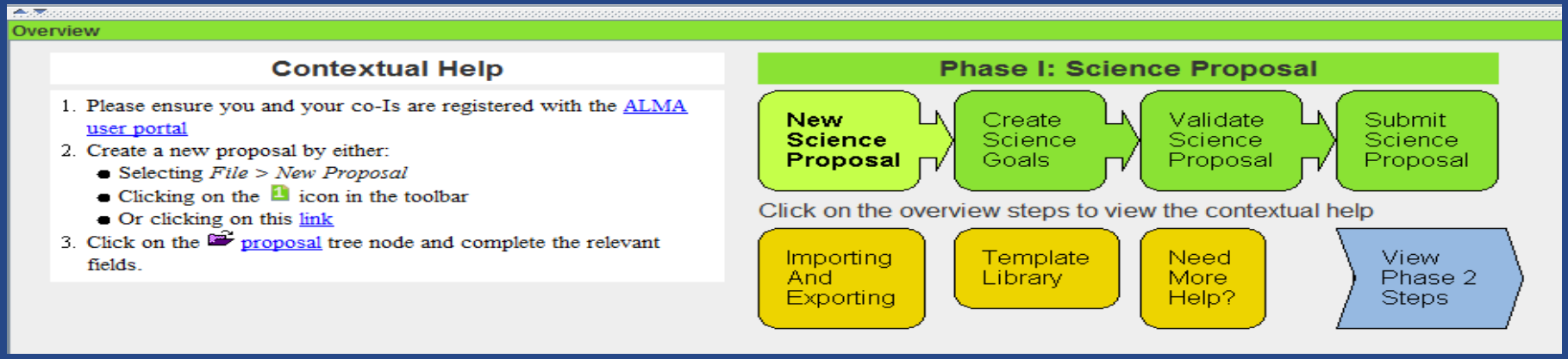
CASA scripting helps in calibration & reduction.

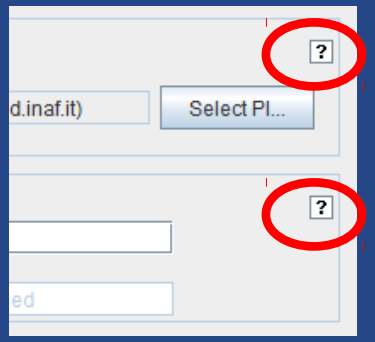
Care for the huge amount of data!!!

Getting help with ALMA

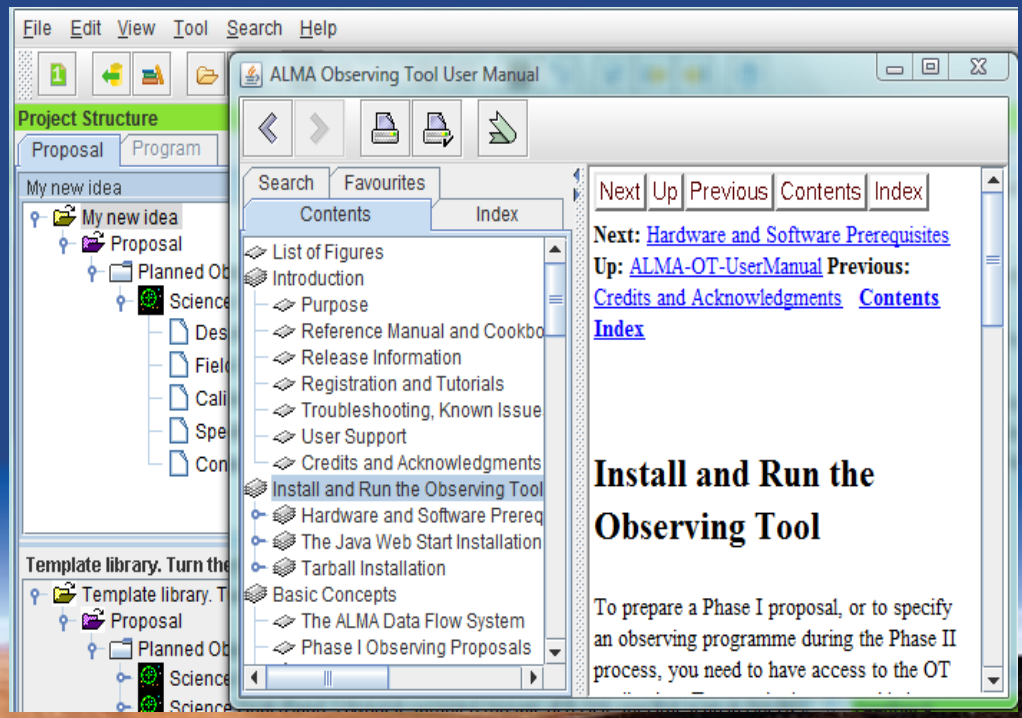
Documentation & Help

Contextual Help in the overview panel





Clickable instruction for each step

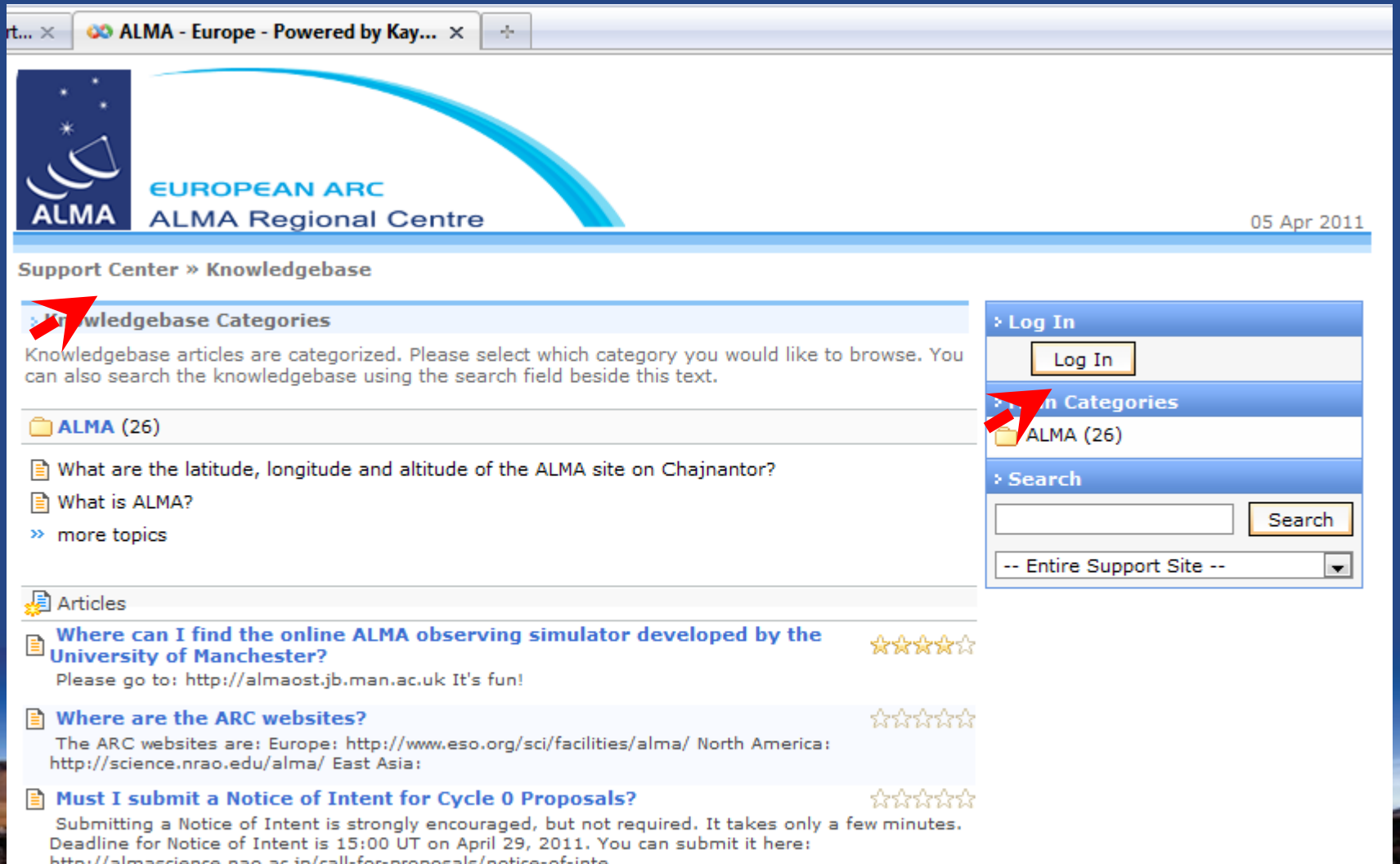


http://almascience.eso.org/
document-and-tools/documents

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/



The Helpdesk

EUROPEAN ARC
ALMA Regional Centre

05 Apr 2011

Support Center

Logged in successfully

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

Submit a Ticket
Submit a new ticket.

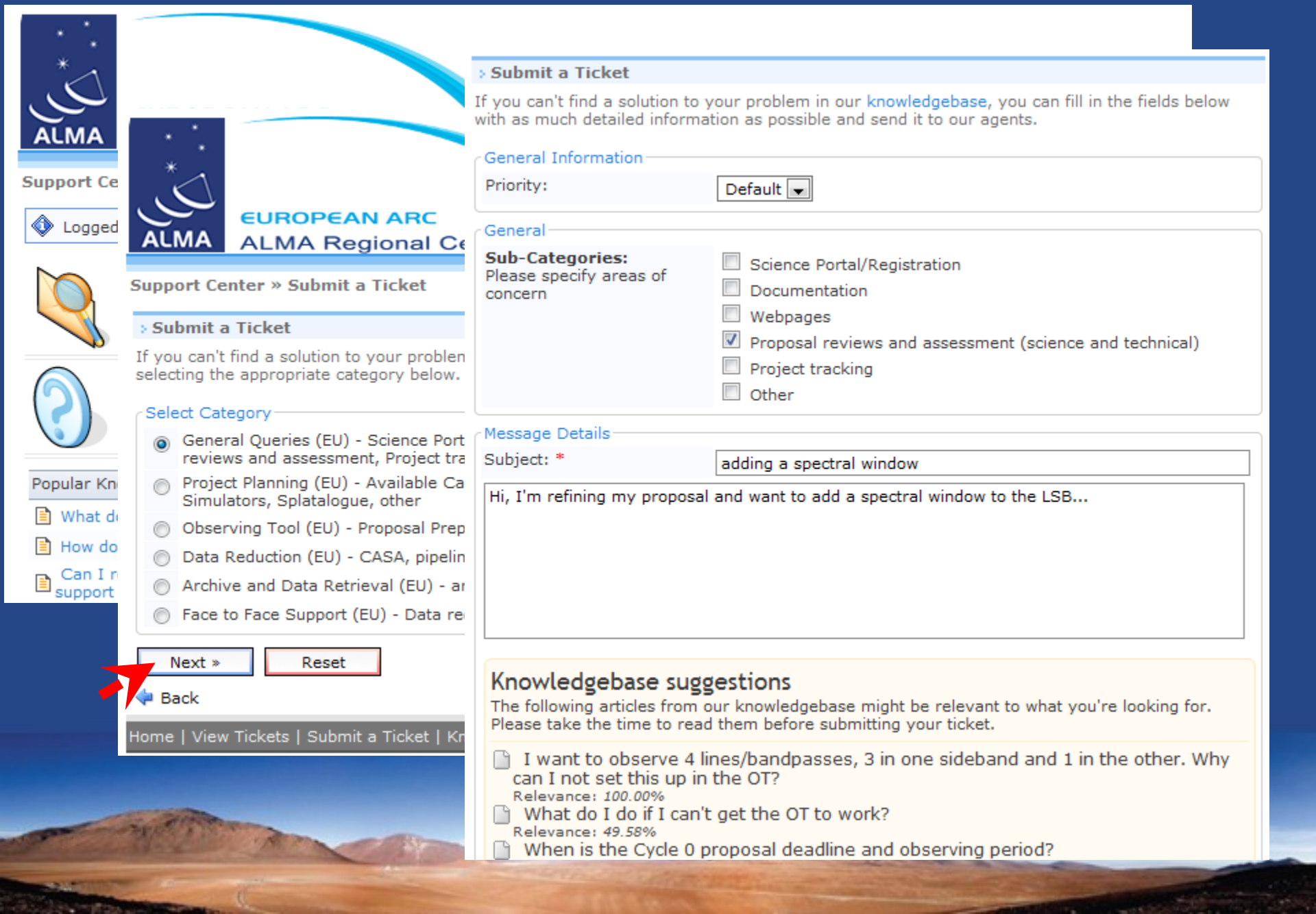
Knowledgebase
Search support articles and find answers to frequently asked questions.

Downloads
View our library of file downloads and links.

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

› My Account [Logout]
Logged In: **Marcella Massardi**
› Search
Search
-- Entire Support Site --

The Helpdesk

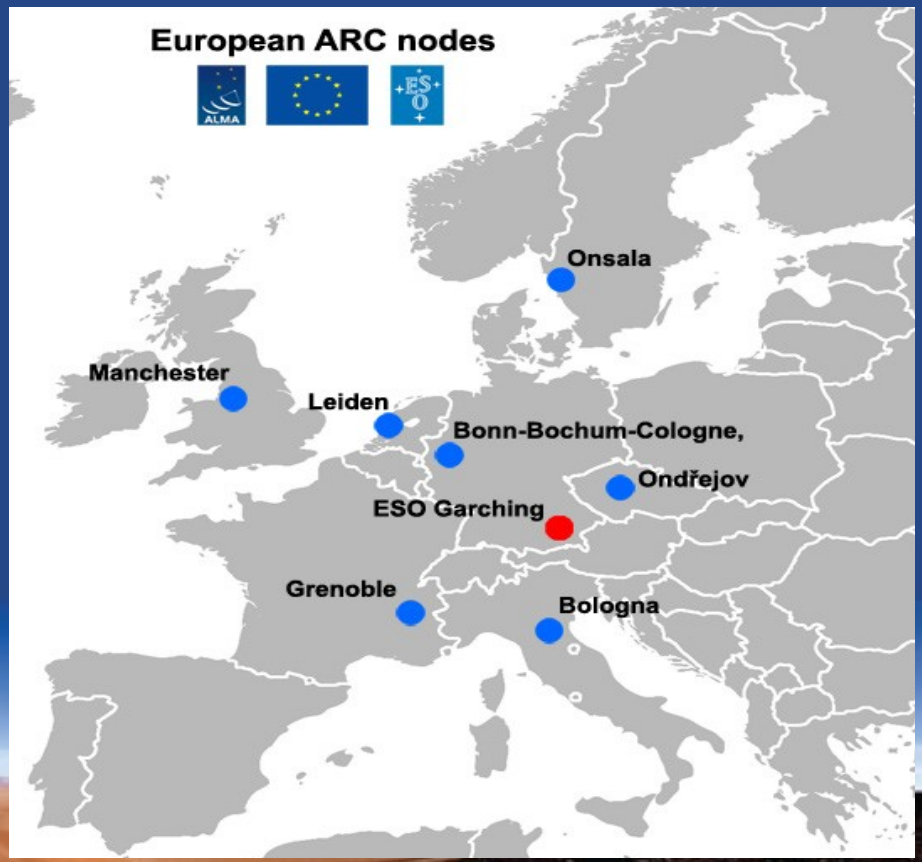


The ALMA Regional Centers (ARC)

- **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

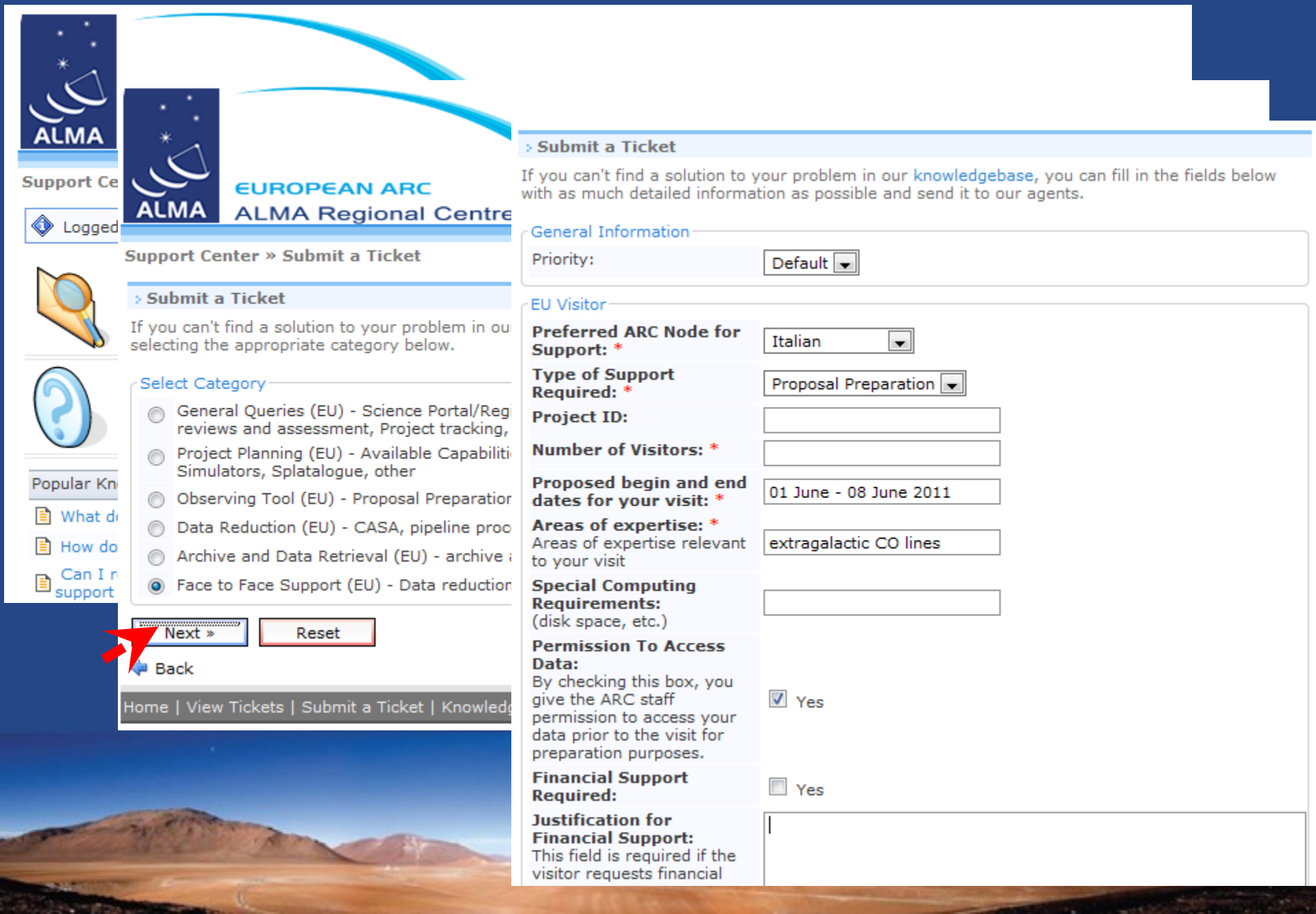
indicating your "favourite" ARC node

- **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/

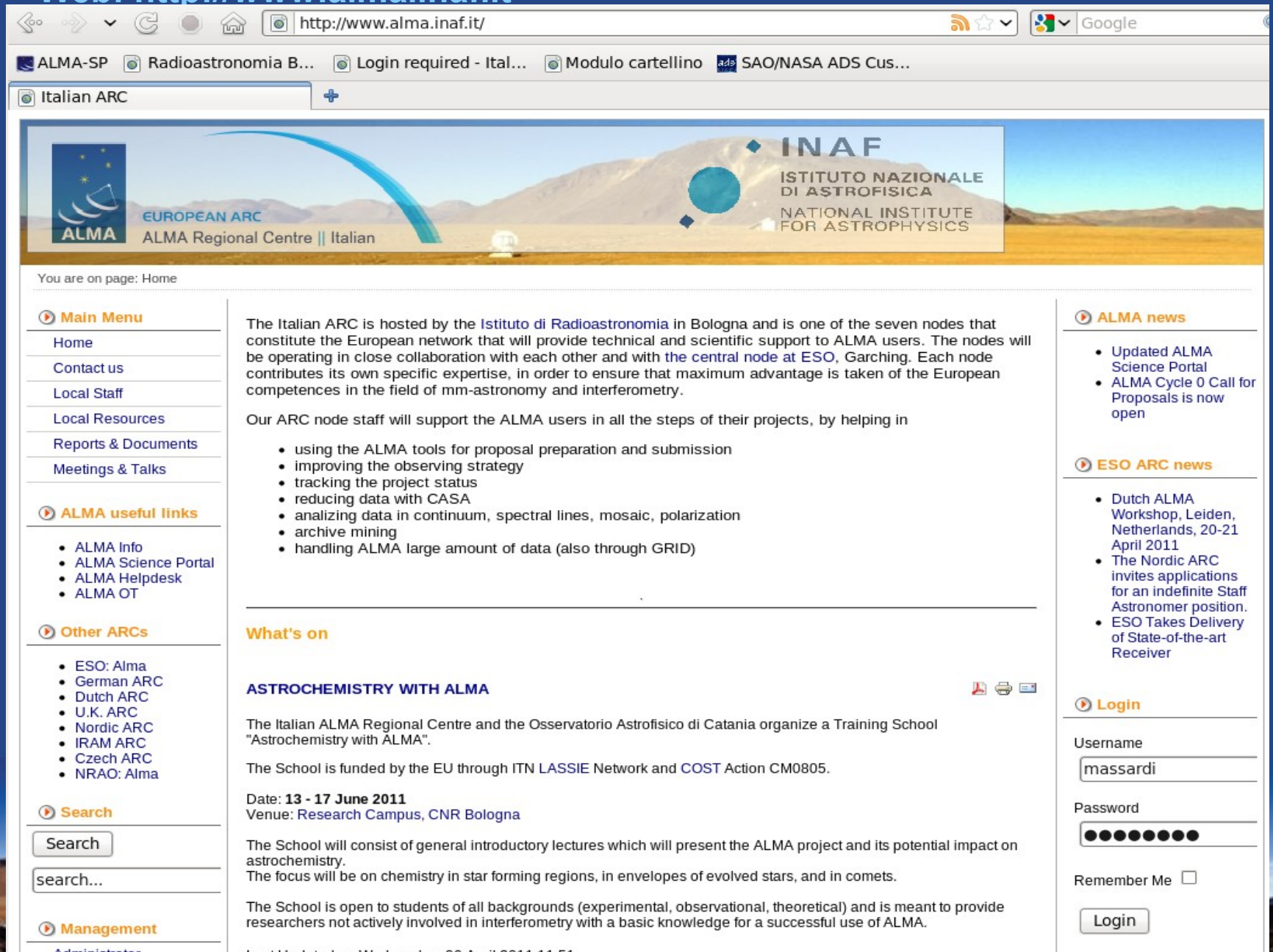
Web: http://www.alma.inaf.it

Request for a f2f visit!!!



Visit our site!!!

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



Summary

- **ALMA is a unique instrument in the (sub-)mm (0.3 to 10 mm) range**
  - Unequaled sensitivity
    - Large collecting area (7200 m^2), 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