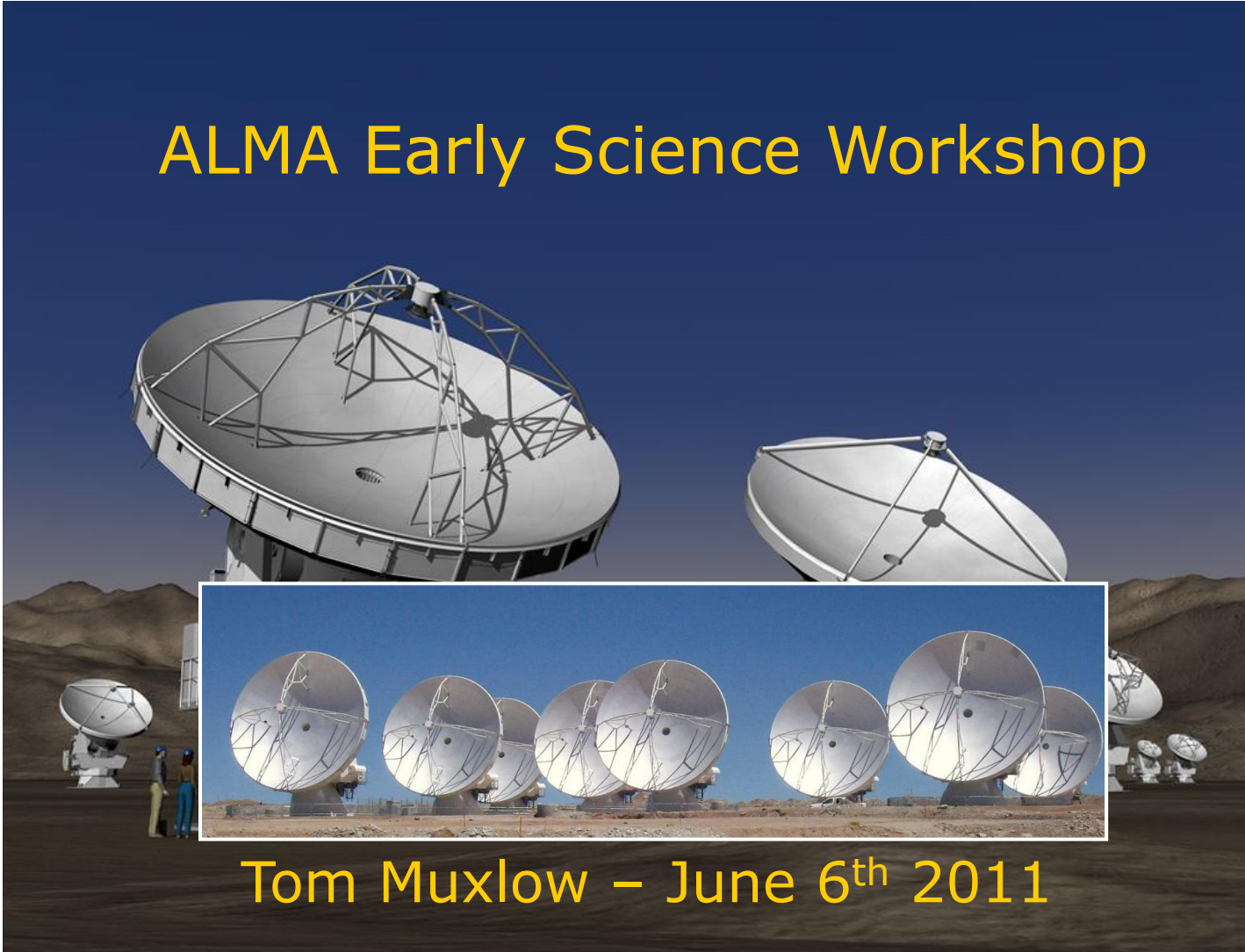




ALMA Early Science Workshop



Tom Muxlow – June 6th 2011

Atacama Large Millimetre Array



Band 1: 31 GHz - 45 GHz
Band 2: 67 GHz - 90 GHz
Band 3: 84 GHz - 116 GHz
Band 4: 125 GHz - 163 GHz
Band 5: 163 GHz - 211 GHz
Band 6: 211 GHz - 275 GHz
Band 7: 275 GHz - 373 GHz
Band 8: 385 GHz - 500 GHz
Band 9: 602 GHz - 720 GHz
Band10: 787 GHz - 950 GHz

Full operations:

50×12m dishes 150m–14km for imaging
+ Compact array of 1×27m + 4×12m
dishes for total power

Array Operations Site (5100m)
Operations Support Facilities (2900m)
Joint ALMA Office (Santiago)

AOS
OSF
JAO

Remote service observing
Dynamic scheduling

Atacama Large Millimetre Array

6-Jun-11: 14 antennas at AOS – fringes from 11/12...



Band 1: 31 GHz – 45 GHz
Band 2: 67 GHz – 90 GHz
Band 3: 84 GHz – 116 GHz
Band 4: 125 GHz – 163 GHz
Band 5: 163 GHz – 211 GHz
Band 6: 211 GHz – 275 GHz
Band 7: 275 GHz – 373 GHz
Band 8: 385 GHz – 500 GHz
Band 9: 602 GHz – 720 GHz
Band 10: 787 GHz – 950 GHz

Early Science:

>16×12m dishes 18m→400m (imaging)

→ mJy sensitivity with 0.1-~1" resolution

Array Operations Site (5100m)

Operations Support Facilities (2900m)

Joint ALMA Office (Santiago)

AOS

OSF

JAO

Remote service observing
Dynamic scheduling

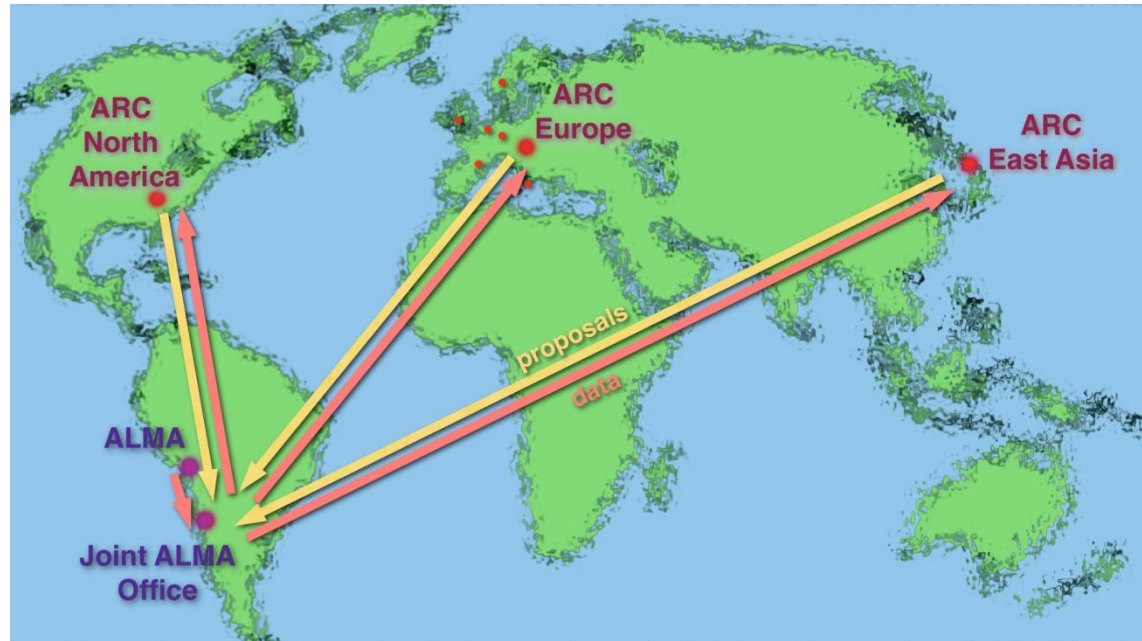
How users will interact with ALMA



Users will interact with ALMA via their local ALMA Regional Centre (ARC).

Proposal preparation will be performed locally before being transmitted to the Joint ALMA Office (JAO).

Pipelined data and images will (eventually) flow back to the user from the JAO via their local ARC.



There are 3 ARCs:

- North American**
- European**
- East Asian**

The European Regional ARC

How to Access ALMA

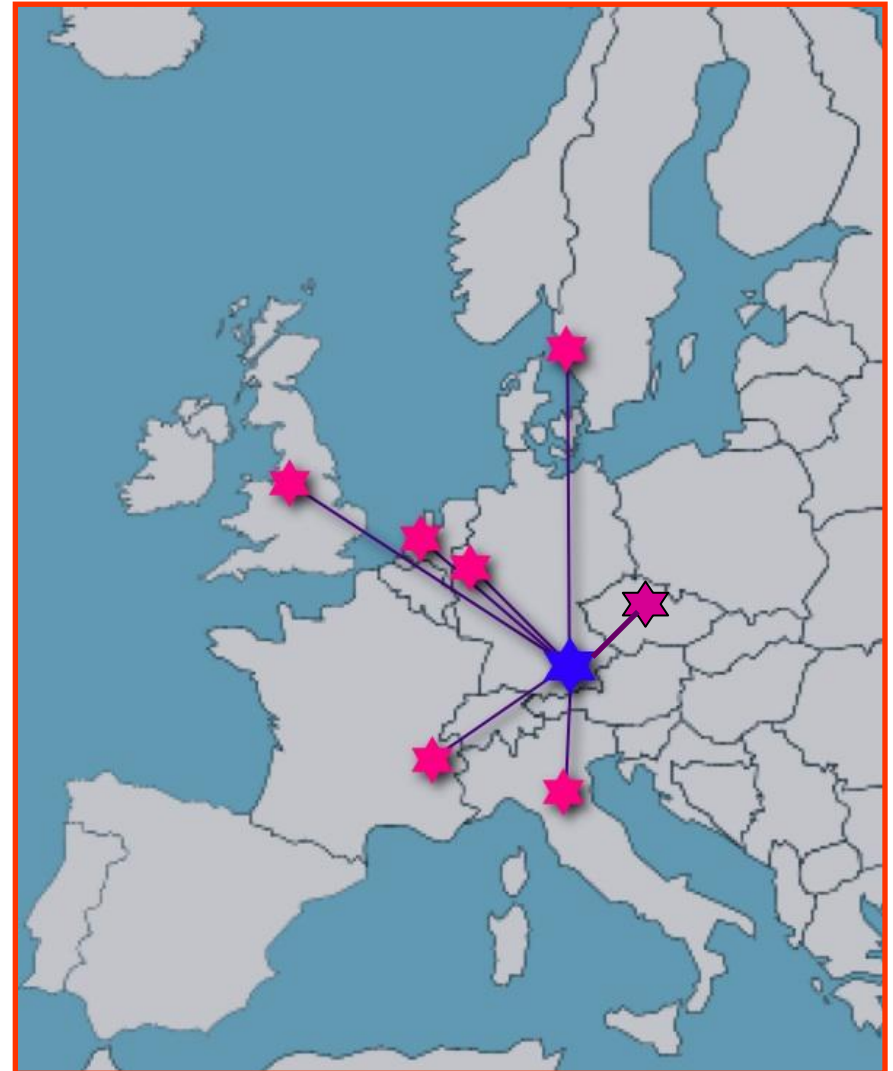


Central ARC at Garching – core user support:

- Mirror of the ALMA archive
- Provision of software tools
- Conduit for proposal submission
- Delivery of pipelined data from JAO
- Central helpdesk

7 European ARC nodes – face-to-face support:

UK	Manchester
Germany	Bonn
Italy	Bologna
Nordic	Onsala
France/Spain	IRAM
Netherlands	Leiden
Czech Republic	Ondřejov



The User ALMA Interface

How to Access ALMA



Based on NRAO/ESO cluster design for optimized CASA functionality:

Compute Nodes - Dell R410, 2x E5645 CPU, 24 GB RAM, 2 TB disk [6-core hyperthreaded]

Data Storage Nodes - Dell R510, 1x E5620 CPU, 4 GB RAM, 12x 2 TB disk

Meta Data Node - Dell R410, 2x E5645 CPU, 8GB RAM, 2x 500 GB disk

10 Gbit Network Switch - Dell 8024F 24 ports

All nodes feature 10 Gbit/s Ethernet card

Initially [Q3 2011] – for Cycle 0 data processing:

- 4 compute nodes

- 2 storage nodes

- 1 metadata node

- 1 network switch

2 storage nodes gives 40TB of addressable storage

Upgrade [Q3 2012] – for later cycles:

- 4 additional computing nodes

- Additional storage nodes as required

ALMA in Early Science

How to propose



Two cycle 0 Configurations:

Compact Configuration:

Minimum baselines: ~18m

Maximum baselines: ~125m

Extended Configuration:

Minimum baselines: ~36m

Maximum baselines: ~400m

16 antennas

Single fields, mosaicing (<50)

Few mJy typical spectral sensitivity

~mJy continuum in full track

Earth-rotation aperture synthesis

needed for extended objects

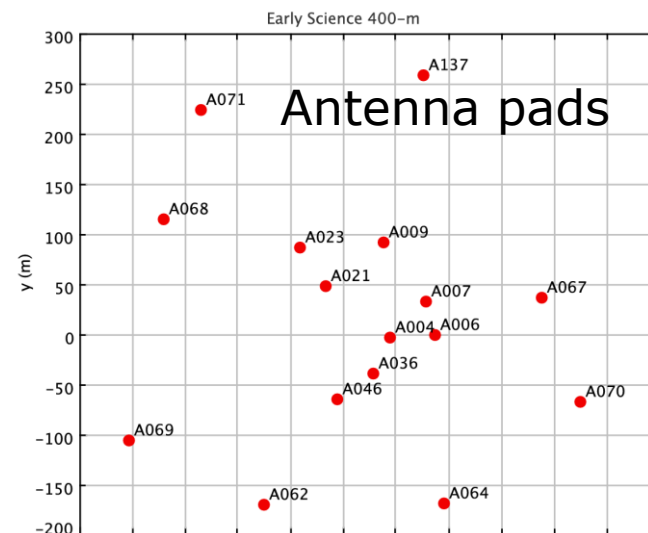
-simulate!!

User software

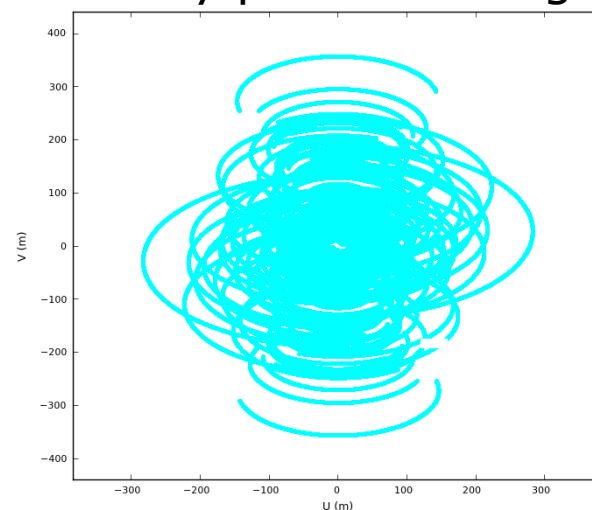
OT (proposing and scheduling)

OST (web-based simulator)

CASA data reduction



Visibility plane coverage



ALMA in Early Science

How to propose



Two cycle 0 Configurations:

Compact Configuration:

Minimum baselines: ~18m

Maximum baselines: ~125m

Extended Configuration:

Minimum baselines: ~36m

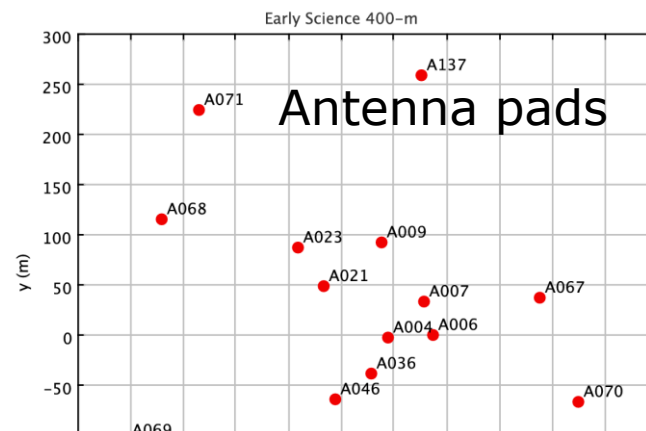
Maximum baselines: ~400m

16 antennas

- Single fields, mosaicing (<50)
- Few mJy typical spectral sensitivity
- ~mJy continuum in full track
- Earth-rotation aperture synthesis needed for extended objects
- simulate!!

User software

- OT (proposing and scheduling)
- OST (web-based simulator)
- CASA data reduction



Band	Frequency [GHz]	Angular Resolution ["]	Maximum Scale ["]	T _{bc}	Flux	T _{bl}	Field of View
				[mK]	[mJy]	[K]	["]
5σ t=1hr							
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 Science Portal

How to propose



Information on ALMA is available via UK ARC node web pages:

<http://www.alma.ac.uk>

- or through the ALMA Science Portal

<http://almascience.eso.org>

You will need to register & log in

You can access information about ALMA, ALMA Science, Cycle 0 Call for Proposals, & any available Science Verification data

You can access important tools and documentation for use in proposal preparation:

- ALMA Observing Tool (OT)
- ALMA Observation Support Tool (OST)
- ALMA Sensitivity Calculator
- Splatalogue
- CASA & CASA Simulator

You can submit enquiries via the helpdesk

ALMA Science Portal

How to propose



Information on ALMA is available via UK ARC node web pages:

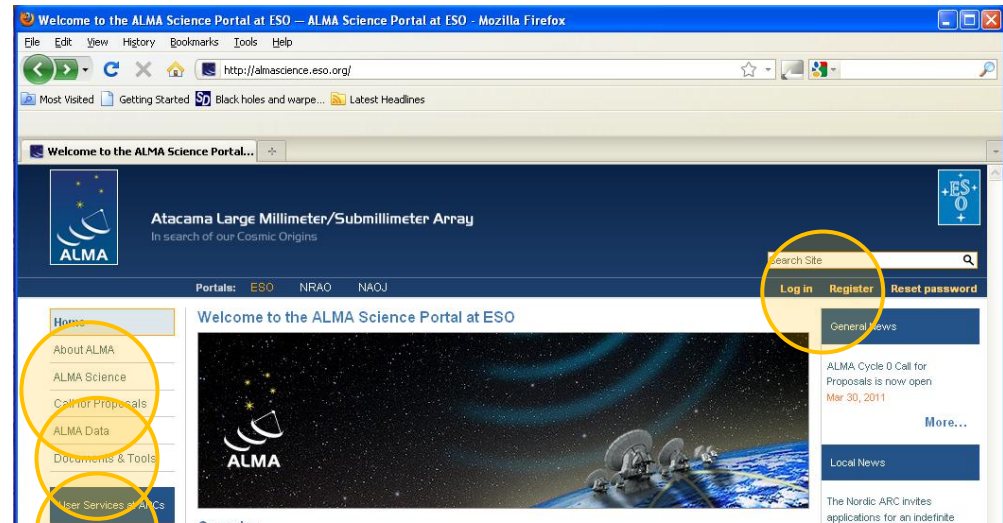
<http://www.alma.ac.uk>

- or through the ALMA Science Portal

<http://almascience.eso.org>

You will need to register & log in

You can access information about ALMA, ALMA Science, Cycle 0 Call for Proposals, & any available Science Verification data



Recent SV Data Releases:

NGC3256: Extreme starburst merging galaxy [37Mpc]

Band 3 (Continuum + CO(1-0) line)

Beam $\sim 6.5''$

- Tracing the molecular gas distribution *HST WFC2*



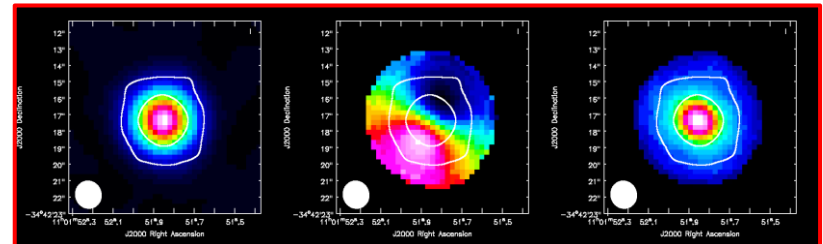
TWHydra: Pre-main sequence T-Tauri star [52pc]

Band 7 (Continuum + CO(3-2) & HCO+(4-3))

Beam $\sim 1.5''$

- Using molecular gas to trace the outer cold disk

R to L: integrated intensity, velocity field, velocity dispersion



Observation Support Tool (OST)

How to propose

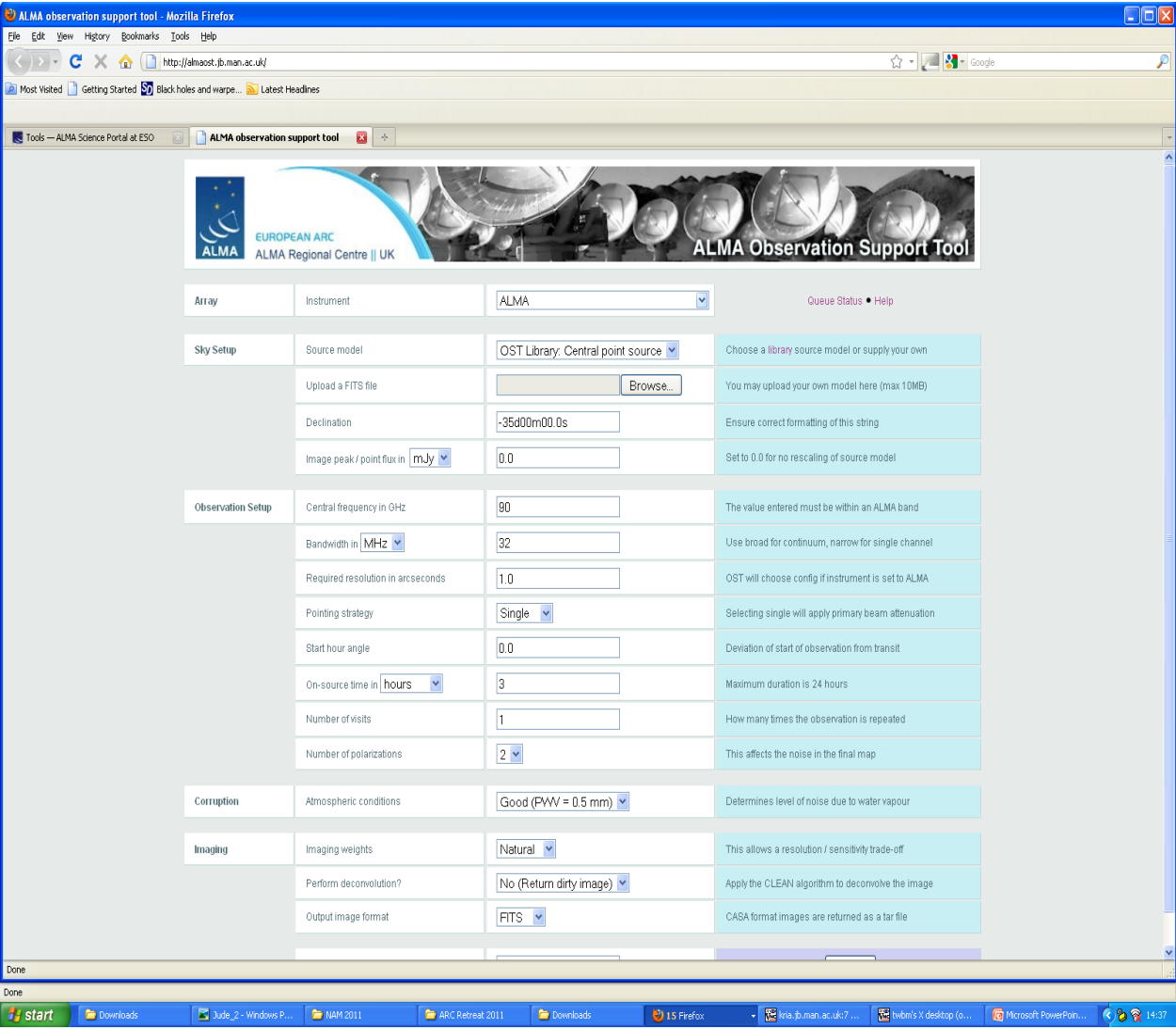


Web-based simulator for proposal preparation
- available via UK ARC node web pages or the Science Portal:
<http://amlaost.jb.man.ac.uk>

Emails a reply to user to inspect web location for display of results

Can utilise a library of images or user can upload a FITS image for simulation test

Demonstration of OST to follow on Tuesday afternoon



Observation Support Tool (OST)

How to propose

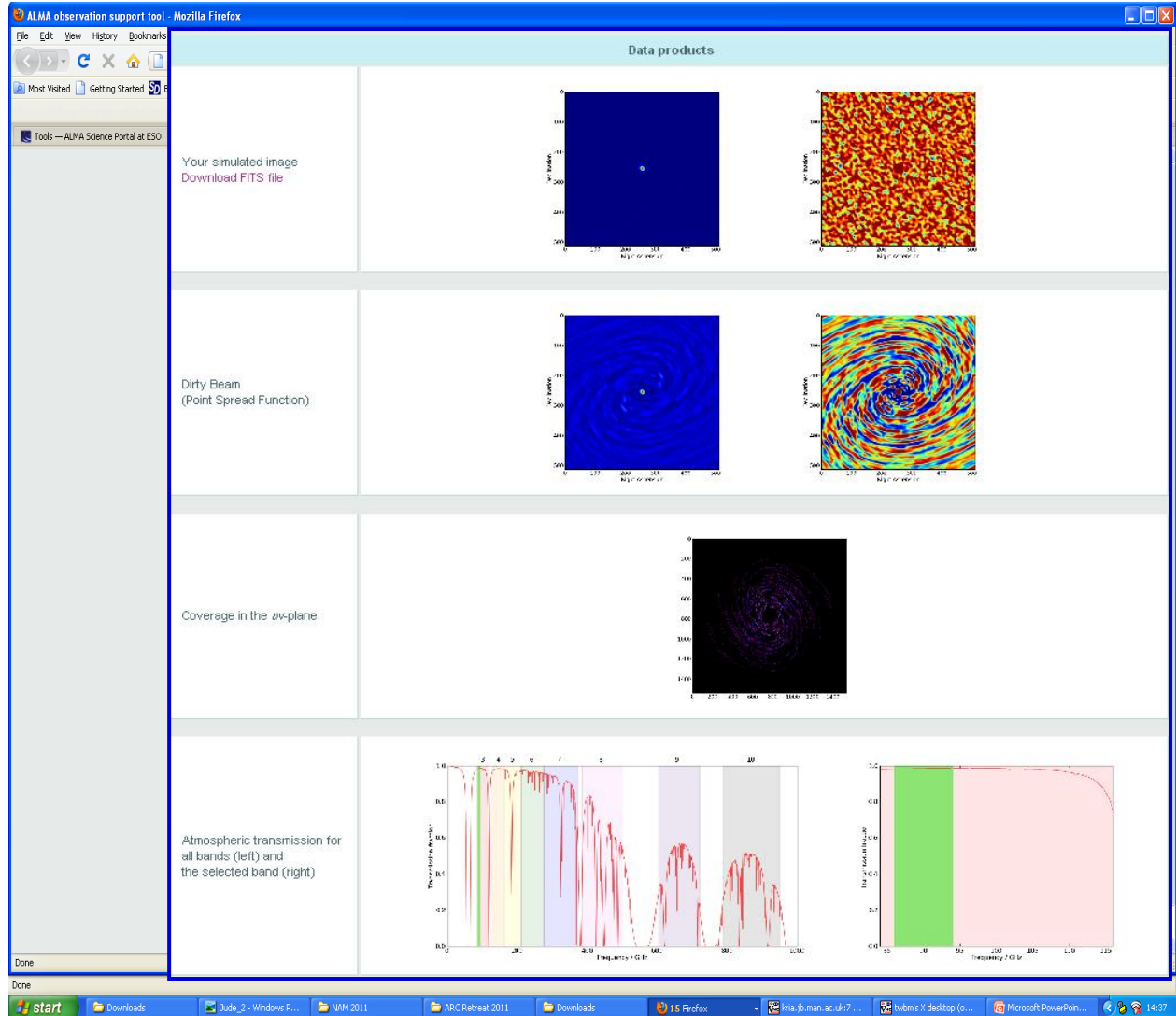


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Can utilise a library of images or user can upload a FITS image for simulation test

Demonstration of OST to follow on Tuesday afternoon



Splatalogue

How to propose



splatalogue.net - Mozilla Firefox

http://www.splatalogue.net/

Tools — ALMA Science Portal at ESO | splatalogue.net

Navigate

- Splatalogue Home
- What's New (Updates & Announcements)
- Motivation
- Notes on Observing Frequencies
- Notes on Quantum Numbers
- Applications (SLAP Interface)
- NRAO Homepage
- NAASC ALMA Science Homepage

Search Parameters

Select Species - Ordered by Mass

- 02903 D13CN - Hydrogen cyanide
- 02904 DC15N - Hydrogen cyanide
- 02905 H15N13C - Hydrogen Isocyanide
- 02906 DN13C - Hydrogen Isocyanide
- 02907 D15NC - Hydrogen Isocyanide
- 02908 H13CNH+ - Iminomethylum
- 02909 HCND+ - Iminomethylum
- 02910 13CO v=0 - Carbon Monoxide
- 02911 13CO v=1 - Carbon Monoxide
- 02912 13CO v=2 - Carbon Monoxide

Mass calculator...

Data Versions

Version 2 (1/1/2010)

Specify Ranges

Specify a Frequency Range:
From 84 to 720

Specify an Energy Range:
From to

Line Intensity Lower Limits

Select Criteria and Specify Lower Limit:

- None
- CDMS/JPL (log)
- Sij μ^2
- Aij (log)

Specify a Transition

(e.g. 1-0)

Search

Search Results

Found 22 lines from 84 - 720 GHz, showing 1 - 22

Click on the chemical formula below for more information about that species.

	Species	Chemical Name	Freq in GHz (Err)	Meas Freq in GHz (Err)	Resolved QNs	CDMS/JPL Intensity	Lovas/AST Intensity	E_L (cm ⁻¹)	Linelist
1	13CO v=0	Carbon Monoxide	110.20135 (1.0E-6)		1-0	0.00000	9.3	0.00000	Lovas
2	13CO v=0	Carbon Monoxide	110.20135 (0)	110.20135 (1.0E-6)	1-0	0.00000	9.3	0.00000	SLAIM
3	13CO v=0	Carbon Monoxide		110.20135 (5.1E-6)	1-0	-5.06620		0.00000	JPL
4	13CO v=0	Carbon Monoxide	110.20135 (0)		1-0	-5.06620		0.00000	CDMS
5	13CO v=0	Carbon Monoxide		220.39868 (5.3E-6)	2-1	-4.17490		3.67590	JPL
6	13CO v=0	Carbon Monoxide	220.39868 (1.0E-6)		2-1	0.00000	17.	0.00000	Lovas
7	13CO v=0	Carbon Monoxide	220.39868 (0)	220.39868 (1.0E-6)	2-1	0.00000	17.	3.67600	SLAIM
8	13CO v=0	Carbon Monoxide	220.39868 (1.0E-7)		2-1	-4.17490		3.67590	CDMS
9	13CO v=0	Carbon Monoxide		330.58796 (4.9E-6)	3-2	-3.66620		11.02760	JPL
10	13CO v=0	Carbon Monoxide	330.58797 (1.0E-6)		3-2	0.00000	16.03	0.00000	Lovas
11	13CO v=0	Carbon Monoxide	330.58797 (1.0E-6)	330.58797 (1.0E-6)	3-2	0.00000	16.03	11.02600	SLAIM
12	13CO v=0	Carbon Monoxide	330.58797 (1.0E-7)		3-2	-3.66620		11.02760	CDMS
13	13CO v=0	Carbon Monoxide		440.76517 (9.4E-6)	4-3	-3.31870		22.05490	JPL
14	13CO v=0	Carbon Monoxide	440.76517 (1.0E-6)	440.76517 (1.0E-6)	4-3	0.00000		22.05500	SLAIM
15	13CO v=0	Carbon Monoxide	440.76517 (2.0E-7)		4-3	-3.31870		22.05490	CDMS
16	13CO v=0	Carbon Monoxide	550.92629 (1.0E-6)	550.92628 (2.0E-6)	5-4	0.00000		36.75700	SLAIM
17	13CO v=0	Carbon Monoxide	550.92629 (3.0E-7)		5-4	-3.06320		36.75720	CDMS
18	13CO v=0	Carbon Monoxide		550.92630 (3.04E-5)	5-4	-3.06320		36.75720	JPL
19	13CO v=0	Carbon Monoxide	661.06728 (2.0E-6)		6-5	0.00000	64.0	0.00000	Lovas
20	13CO v=0	Carbon Monoxide	661.06728 (1.0E-6)	661.06728 (2.0E-6)	6-5	0.00000	64.0	55.13400	SLAIM
21	13CO v=0	Carbon Monoxide	661.06728 (5.0E-7)		6-5	-2.86870		55.13410	CDMS
22	13CO v=0	Carbon Monoxide	661.06728 (2.37E-5)		6-5	-2.86870		55.13410	JPL

Found 22 lines from 84 - 720 GHz, showing 1 - 22

Query took 0 seconds

Field Separator Range

- Tab
- Comma
- Colon
- Ampersand (TeX)
- All Records
- Current Page

Find the lines you want...

ALMA Observing Tool (OT)

How to propose



Project - Observing Tool for Chajnantor, version R8.0.1p2

File Edit View Tool Search Help

Perspective 1

Project Structure

- unnamed project
 - object
 - Proposal
 - Planned Observing
 - Science Goal (0)
 - Science Goal (0)
 - Description
 - Field Setup
 - Calibration S
 - Spectral Set
 - Control and

Editors

Spectral Spatial Spectral Setup Catalog

Visualisation

After creating spectral setups in the forms you may visualize them here.
Left/right click to zoom in/out, grab sliding bar to pan
Note: Moving LO1 here is for experimentation only - actual setup determined by the windows

Observed Frequency

Frequency in Target Frame

Overlays: Receiver Bands Transmission Overlay Lines [Select Lines to Overlay...](#)

Viewport: [Pan to Line](#) [Zoom to Band](#) [Reset](#)

Spectral Type

Up to 4 spectral elements/windows
 More than 4 spectral elements/windows
 Single continuum (average frequency)
 Spectral scan

Spectral Type: Choose the type of spectral observation you wish to make

Feedback

[Problems](#) [Information](#) [Log](#)

Description	Suggestion

Overview

Visualisation:

Set observing bands to match required lines

ALMA Observing Tool (OT)

How to propose

Utilises:

Template library

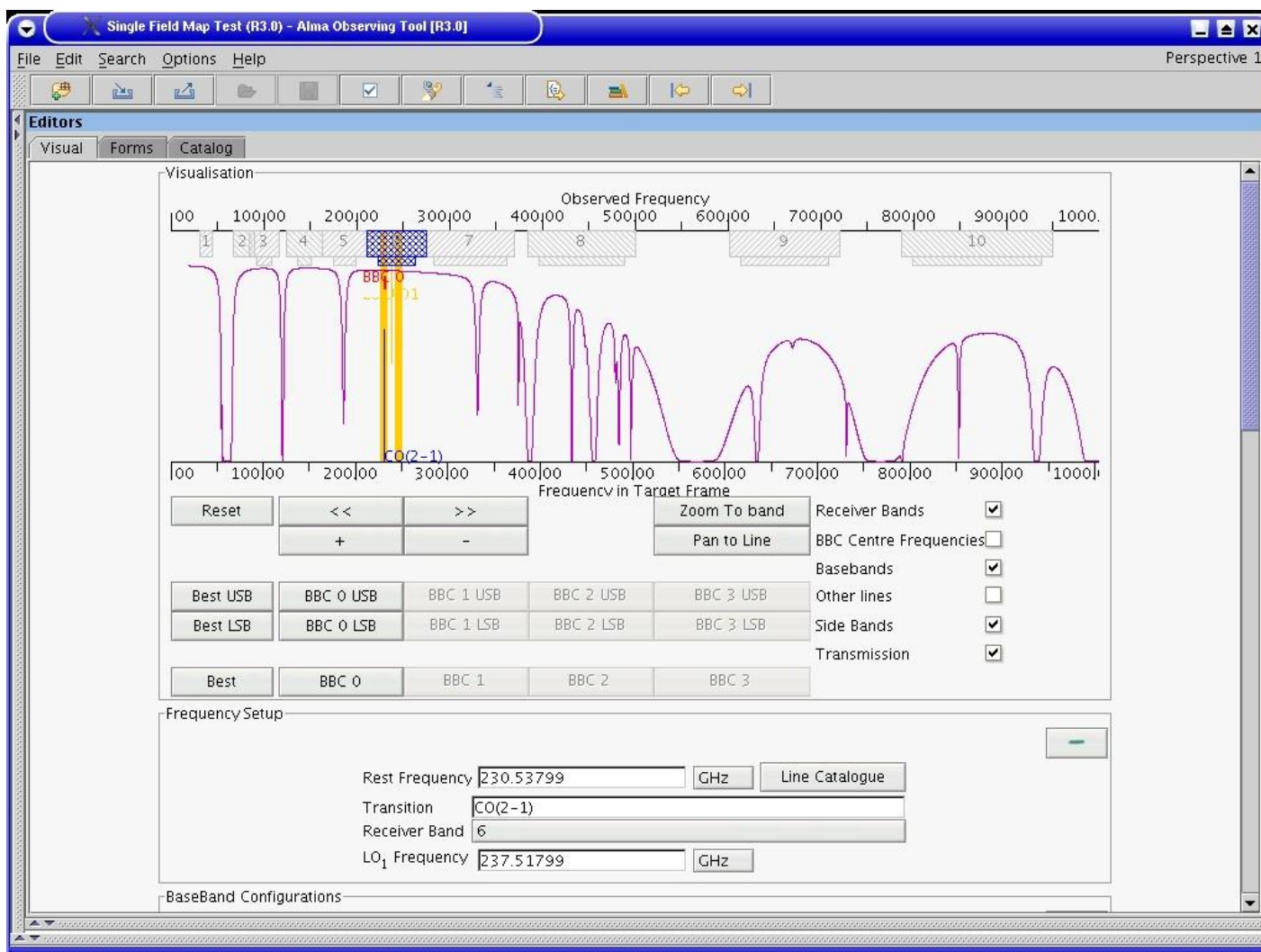
Built-in tools

Sensitivity calculator

Line list

Mosaicing

Demonstration of
OT to follow on
Tuesday morning



ALMA Observing Tool (OT)

How to propose

Utilises:

Template library

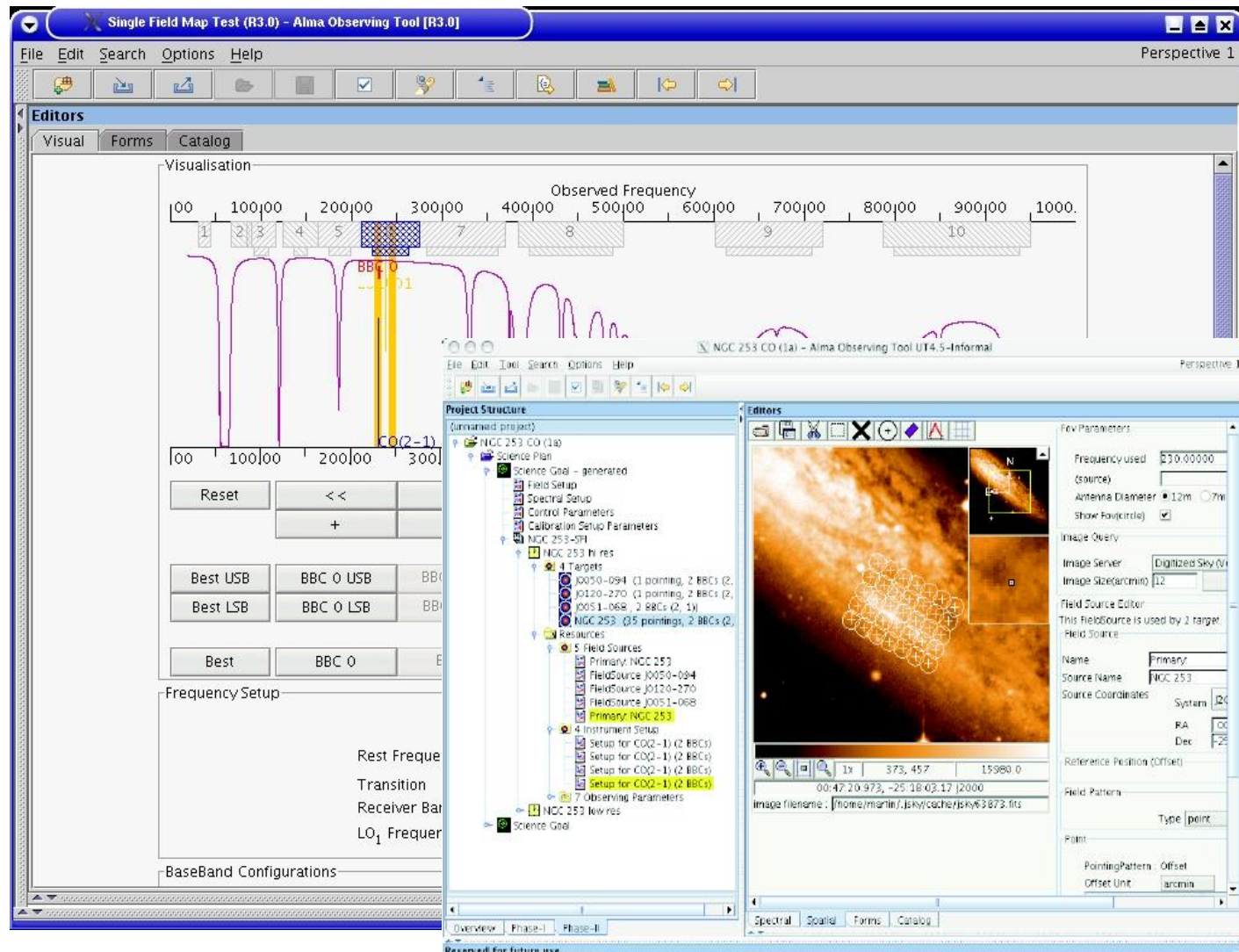
Built-in tools

Sensitivity calculator

Line list

Mosaicing

Demonstration of
OT to follow on
Tuesday morning



Cycle 0 Timeline



The key dates in the current plans for Cycle 0 are given below:

31 March 2011: Release of this Call for Proposals for ALMA Early Science Cycle 0 and release of offline Observing Tool.

29 April 2011: Deadline for submission of Notice of Intent (Voluntary) .

15 May 2011: Release of Cycle 0 Technical Handbook and intended schedule of compact and extended configuration availability.

1 June 2011: Opening of archive for proposal submission and release of the online version of the Observing Tool.

Now

30 June 2011: Proposal submission deadline.

September 2011: Feedback to proposers on the results from the proposal review process.

30 September 2011: Start of ALMA Cycle 0 observing.

February 2012: One month engineering shutdown during the 2012 Altiplanic winter.

March/April 2012: Expected deadline for proposal submission for Cycle 1

30 June 2012: End of ALMA Cycle 0.

Programme

Monday 6 June

1300	<i>Registration and Lunch</i>		
1400	ALMA progress and Early Science Capabilities	Talk	Gary Fuller
1500	What the UK ARC can do for you	Talk	Tom Muxlow
1515	ALMA Portal and Helpdesk	Talk/demo	George Bendo
1545	<i>Tea</i>		
1615	Introduction to interferometry	Talk	Anita Richards
1730	<i>end of day 1</i>		

Tuesday 7 June

0900	Introduction to ALMA Observing Tool and getting started	Talk/demo/hands on	Alan Bridger
1030	<i>Coffee</i>		
1100	Preparing proposals with the ALMA OT	Hands on	
1300	<i>Lunch</i>		
1430	Simulations for ALMA: The Observing Support Tool	Talk/demo/hands on	Adam Avison
1545	<i>Tea</i>		
1615	Introduction to CASA for simulations	Demo/hands on	Jaime Pineda
1730	<i>end of day 2</i>		

Wednesday 8 June

0900	Data reduction in CASA (or room to continue working on ALMA proposals if preferred, with staff available for consultation)	Hands on	Anita Richards
1230	<i>Lunch and close</i>		

Need Information? – See: <http://www.alma.ac.uk>