ALMA Observing Tool

Philippe Salomé

l'Observatoire de Paris
LERMA
Laboratoire d'Etude du Rayonnement et de la Matière en Astrophysique

iram

IRAM interferometry School

OT Team

Development based in Edinburgh (UKTAC)

- A. Bridger (Lead), S. Williams, S. McLay

+ NAOJ (japan) H. yatagai and ESO M. Schilling

Subsystems scientists

- L. Humphrey, A. Biggs (ESO)

Testers

- H. Listz, F. Gueth... (in ARC and ARC nodes)

ALMA Operations

The JAO (Joint Astronomy Observatory) will run the ALMA Operation in Chile

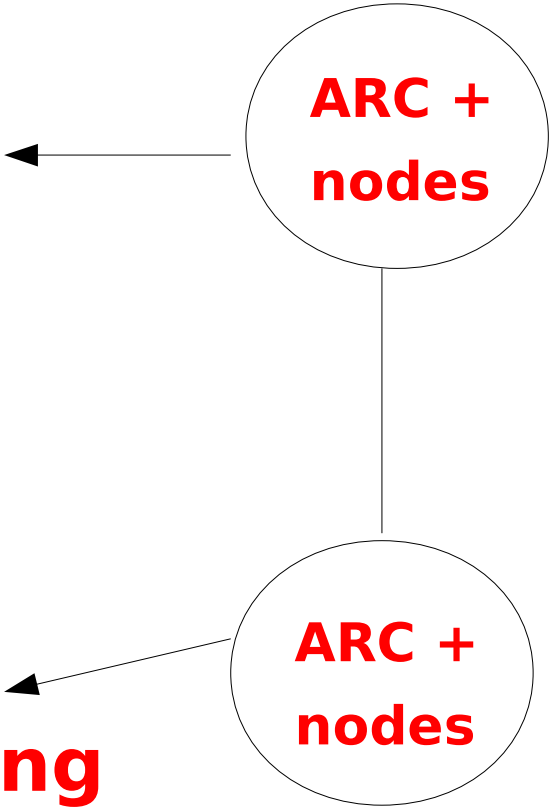
- Not invited to go there (sorry...)

The ARC (ALMA Regional Centers) are the interfaces with the users

- You'll be provided support for proposal preparation, data retrieval and calibration

ALMA Projects

1. **Program Preparation**
2. **Dynamic Scheduling**
3. **Observations**
4. **Data Delivery & Archiving**
5. **Offline Calibration & Imaging**



ALMA Software

1. **Observing Preparation (OT)**
2. **Scheduling (Scheduler)**
3. **Control (Control)**
4. **Telescope Calibration (TelCal)**
5. **Archive (Archive)**
6. **Offline Data Reduction (CASA)**

(cf next talk and DEMO by Dirk Petry)

How to prepare an ALMA Proposal ?

Different tools available

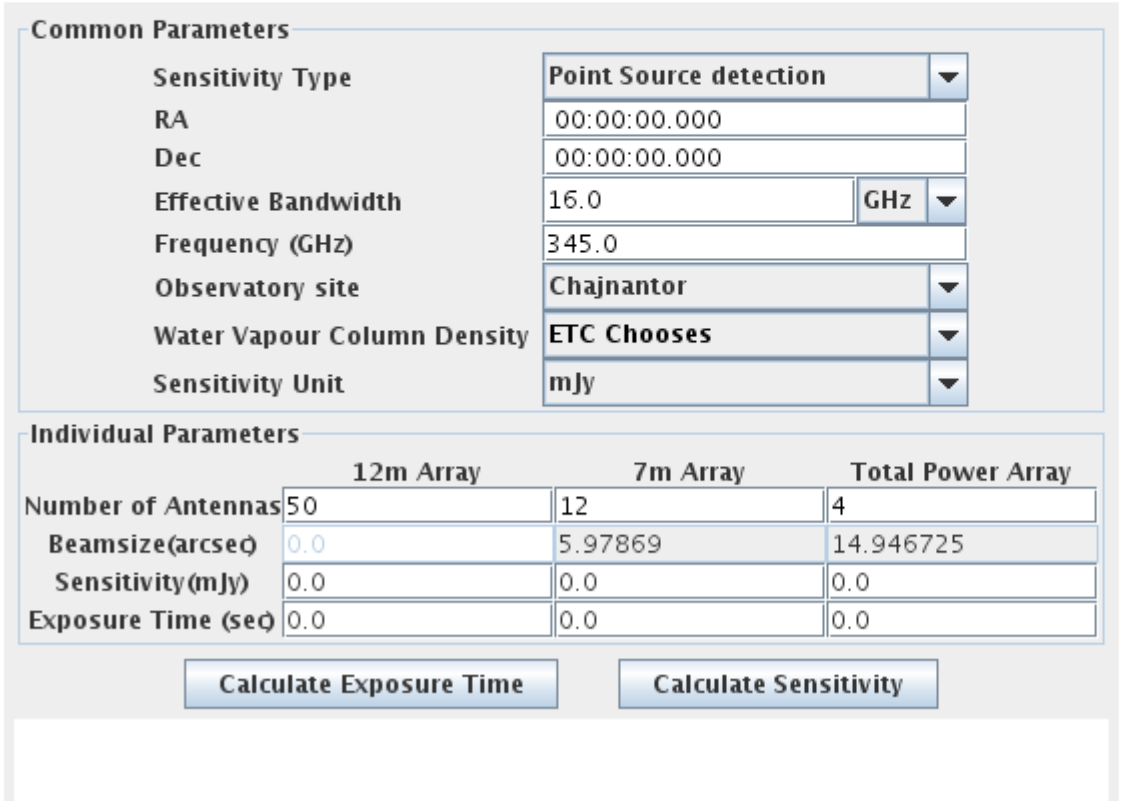
- Sensitivity Estimator

ESO website

ALMA Sensitivity Calculator

This tool will calculate the necessary integration times for a given sensitivity, or vice versa, for your ALMA observing project. Input and output parameters are explained below. You can also get additional information on the valid range for each parameter by hovering your mouse pointer over each field in the calculator applet.

To run the calculator you need the Java Plug-in installed. If you do not see the calculator then it is likely that you do not have it installed. Instructions for installing the plugin will vary depending on your browser and operating system. A plugin compatible with the Java Development Kit version 1.6 (or Java6) is recommended (version 1.5 should work at the moment). Please contact your IT department for installation help if necessary.



Common Parameters

Sensitivity Type	Point Source detection
RA	00:00:00.000
Dec	00:00:00.000
Effective Bandwidth	16.0 GHz
Frequency (GHz)	345.0
Observatory site	Chajnantor
Water Vapour Column Density	ETC Chooses
Sensitivity Unit	mJy

Individual Parameters

	12m Array	7m Array	Total Power Array
Number of Antennas	50	12	4
Beamsize(arcsec)	0.0	5.97869	14.946725
Sensitivity(mJy)	0.0	0.0	0.0
Exposure Time (sec)	0.0	0.0	0.0

Calculate Exposure Time | Calculate Sensitivity

Parameters

Common Parameters

- **Sensitivity Type:** Choose between a point-like or extended source.
- **RA/Dec:** Coordinates of the observation target.
- **Effective Bandwidth:** The standard observing mode will be using two polarizations. Therefore, for continuum observations with 8GHz bandwidth an effective bandwidth of 16GHz needs to be selected. For line observations, use double the spectral resolution element width.
- **Frequency:** Observing frequency. This must be within the boundaries of ALMA bands 1 to 10, which are as follows:
  - 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

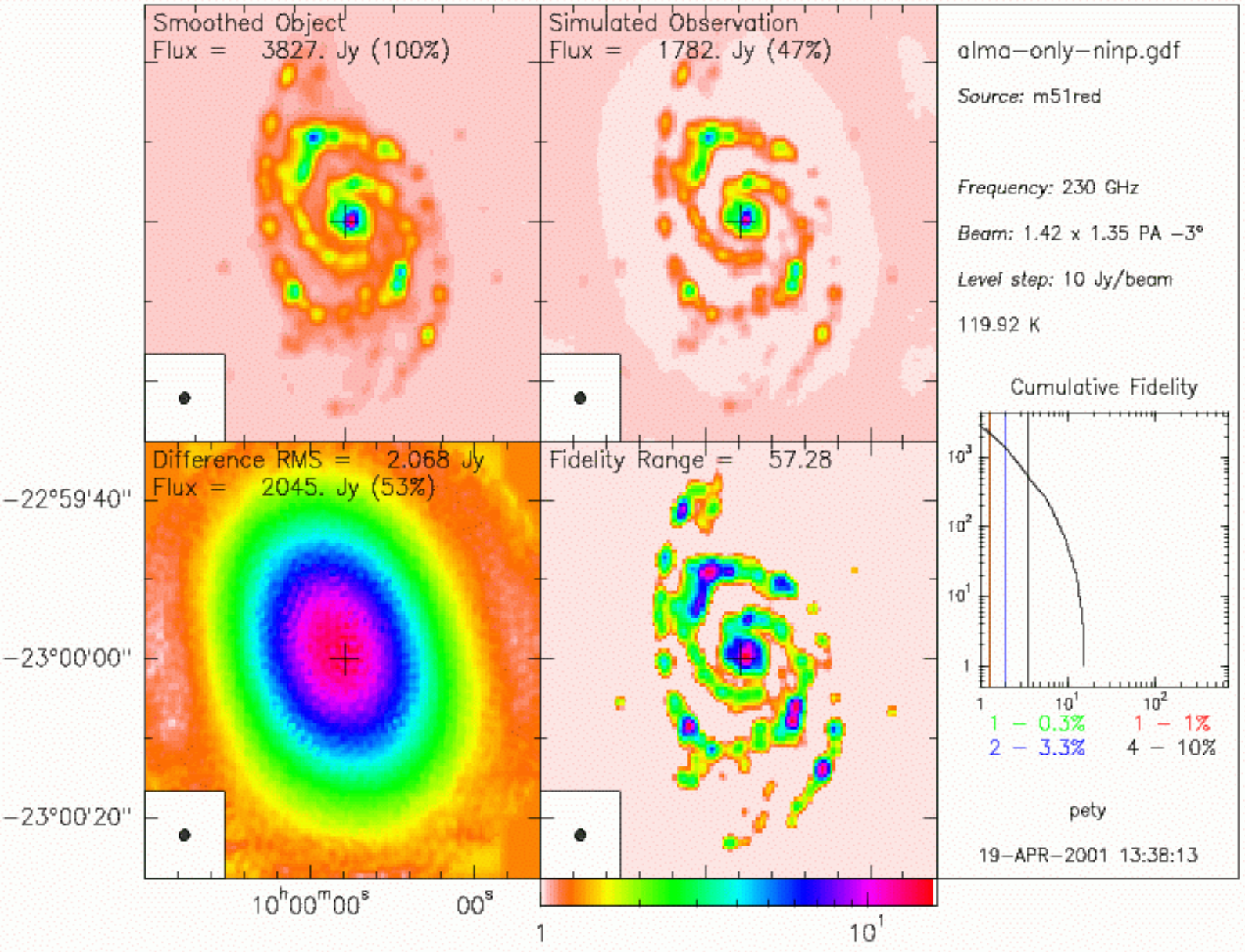
How to prepare an ALMA Proposal ?

Different tools available

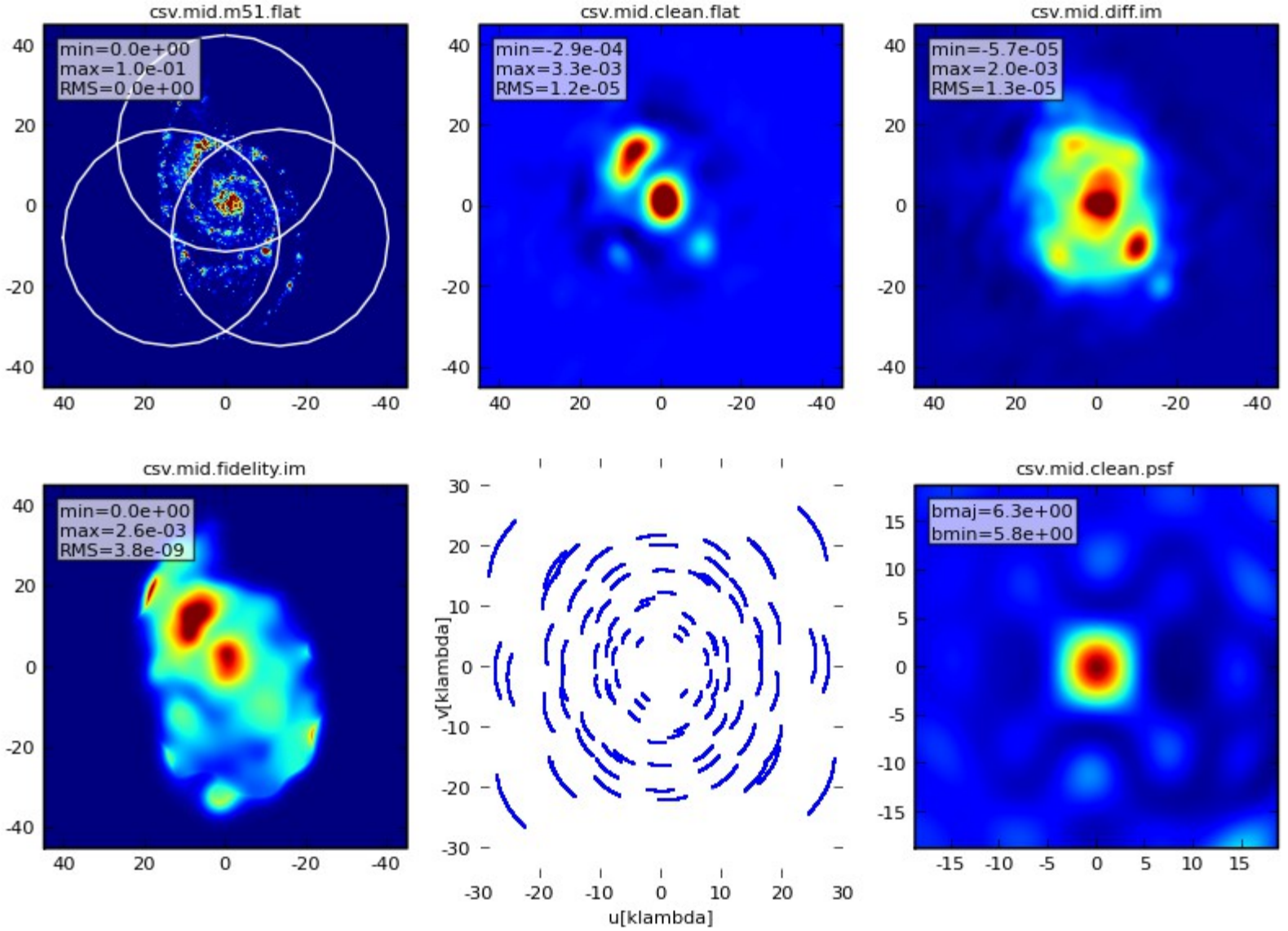
- **Sensitivity Estimator**
- **ALMA Imaging simulators**

GILDAS

D


Smoothed Object
Flux = 3827. Jy (100%)
Simulated Observation
Flux = 1782. Jy (47%)
alma−only−ninp.gdf
Source: m51red
Frequency: 230 GHz
Beam: 1.42 x 1.35 PA −3°
Level step: 10 Jy/beam
119.92 K
Cumulative Fidelity
Difference RMS = 2.068 Jy
Flux = 2045. Jy (53%)
Fidelity Range = 57.28
1 − 0.3%
1 − 1%
2 − 3.3%
4 − 10%
pety
19−APR−2001 13:38:13
−22°59'40"
−23°00'00"
−23°00'20"
10h00m00s
00s
1
10^1

CASA


csv.mid.m51.flat
min=0.0e+00
max=1.0e-01
RMS=0.0e+00
csv.mid.clean.flat
min=-2.9e-04
max=3.3e-03
RMS=1.2e-05
csv.mid.diff.im
min=-5.7e-05
max=2.0e-03
RMS=1.3e-05
csv.mid.fidelity.im
min=0.0e+00
max=2.6e-03
RMS=3.8e-09
v[klambda]
u[klambda]
csv.mid.clean.psf
bmaj=6.3e+00
bmin=5.8e+00

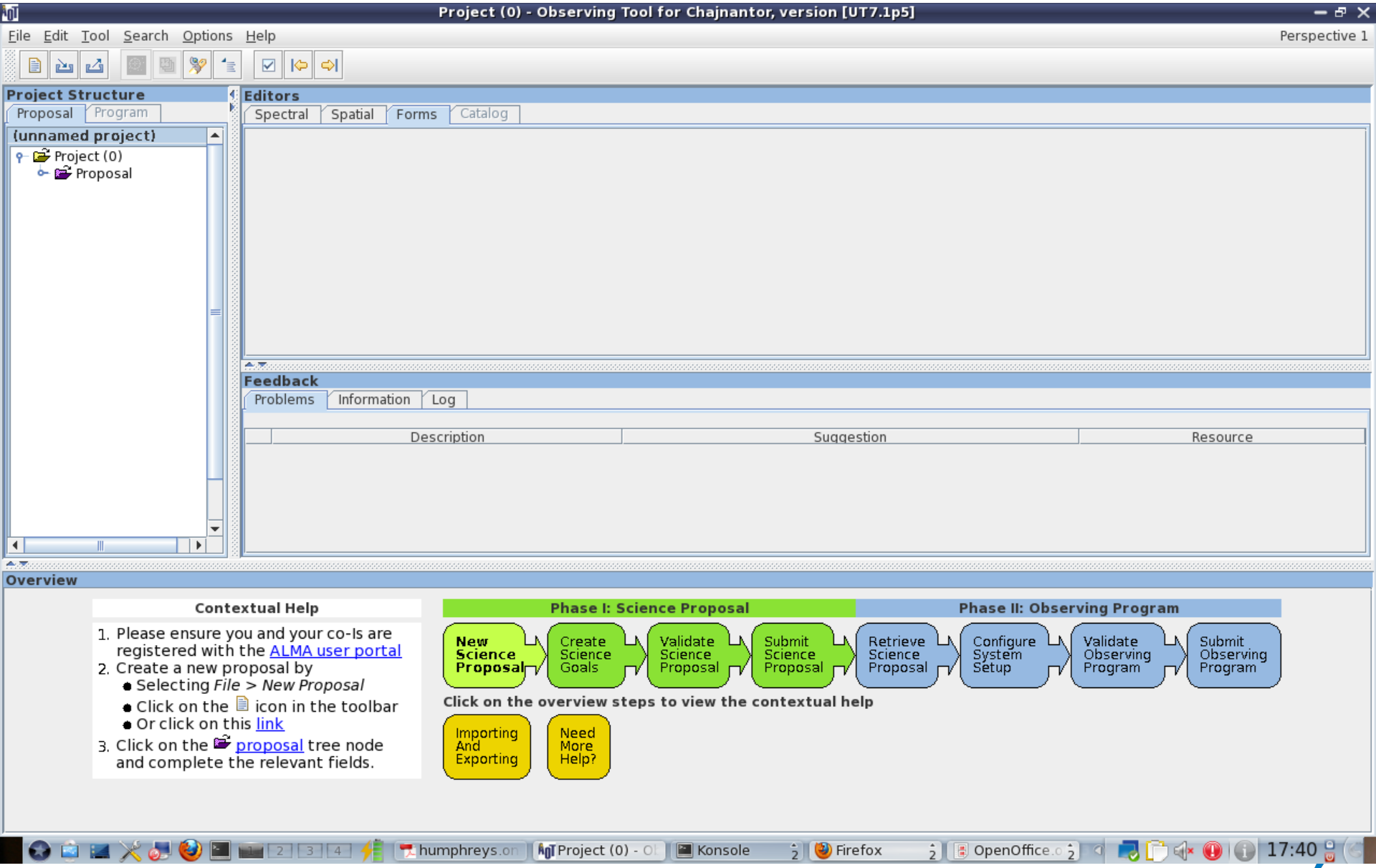
How to prepare an ALMA Proposal ?

Different tools available

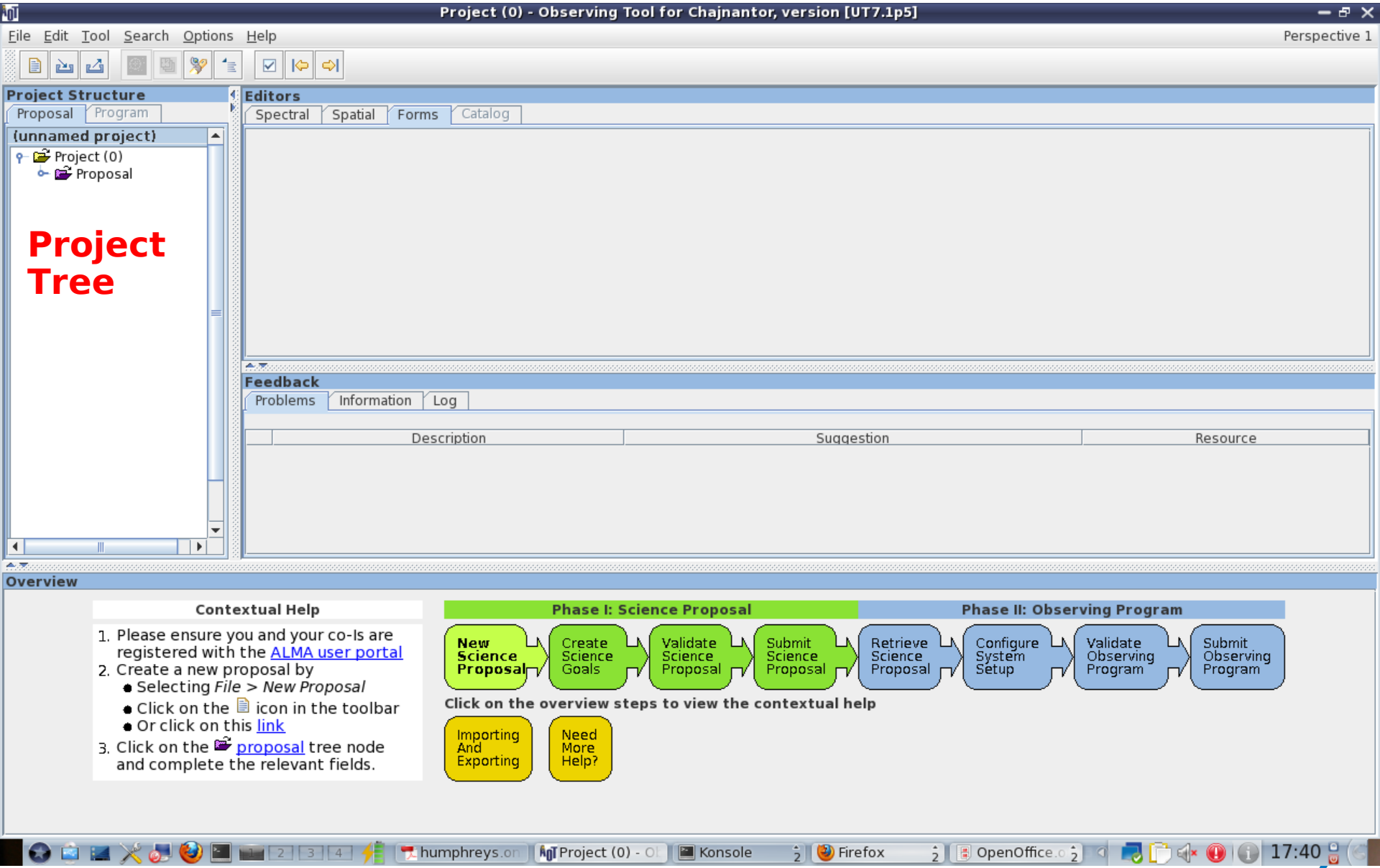
- Sensitivity Estimator
- ALMA Imaging simulators

- Observing Tool (dedicated tool for proposal preparation and submission)

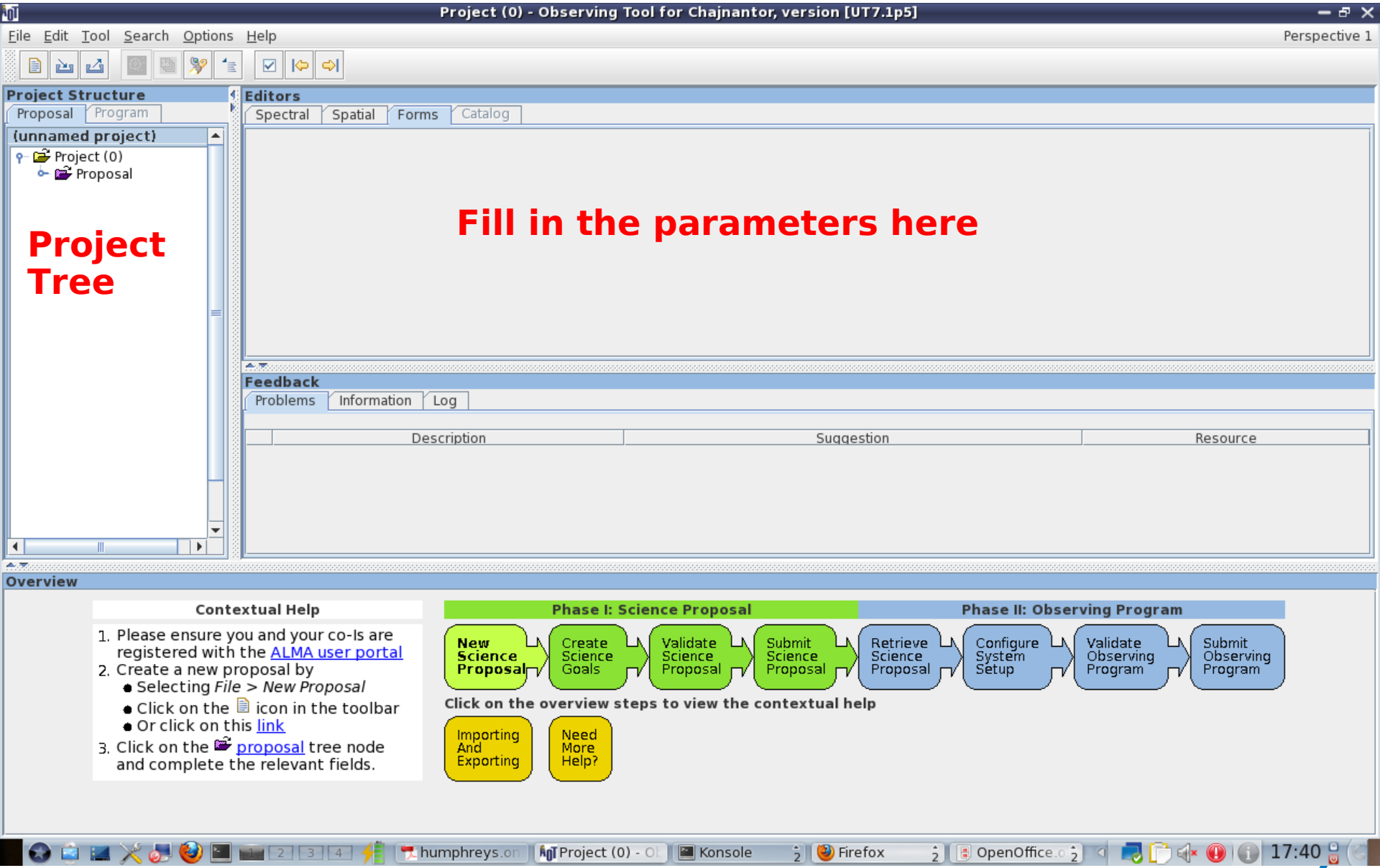
Overview


Project (0) - Observing Tool for Chajnantor, version [UT7.1p5]
File Edit Tool Search Options Help
Perspective 1
Project Structure
Proposal Program
(unnamed project)
Project (0)
Proposal
Editors
Spectral Spatial Forms Catalog
Feedback
Problems Information Log
Description Suggestion Resource
Overview
Contextual Help
1. Please ensure you and your co-Is are registered with the ALMA user portal
2. Create a new proposal by
Selecting File > New Proposal
Click on the icon in the toolbar
Or click on this link
3. Click on the proposal tree node and complete the relevant fields.
Phase I: Science Proposal
Phase II: Observing Program
New Science Proposal
Create Science Goals
Validate Science Proposal
Submit Science Proposal
Retrieve Science Proposal
Configure System Setup
Validate Observing Program
Submit Observing Program
Click on the overview steps to view the contextual help
Importing And Exporting
Need More Help?
humphreys.on
Project (0) - Ob
Konsole
Firefox
OpenOffice.o
17:40

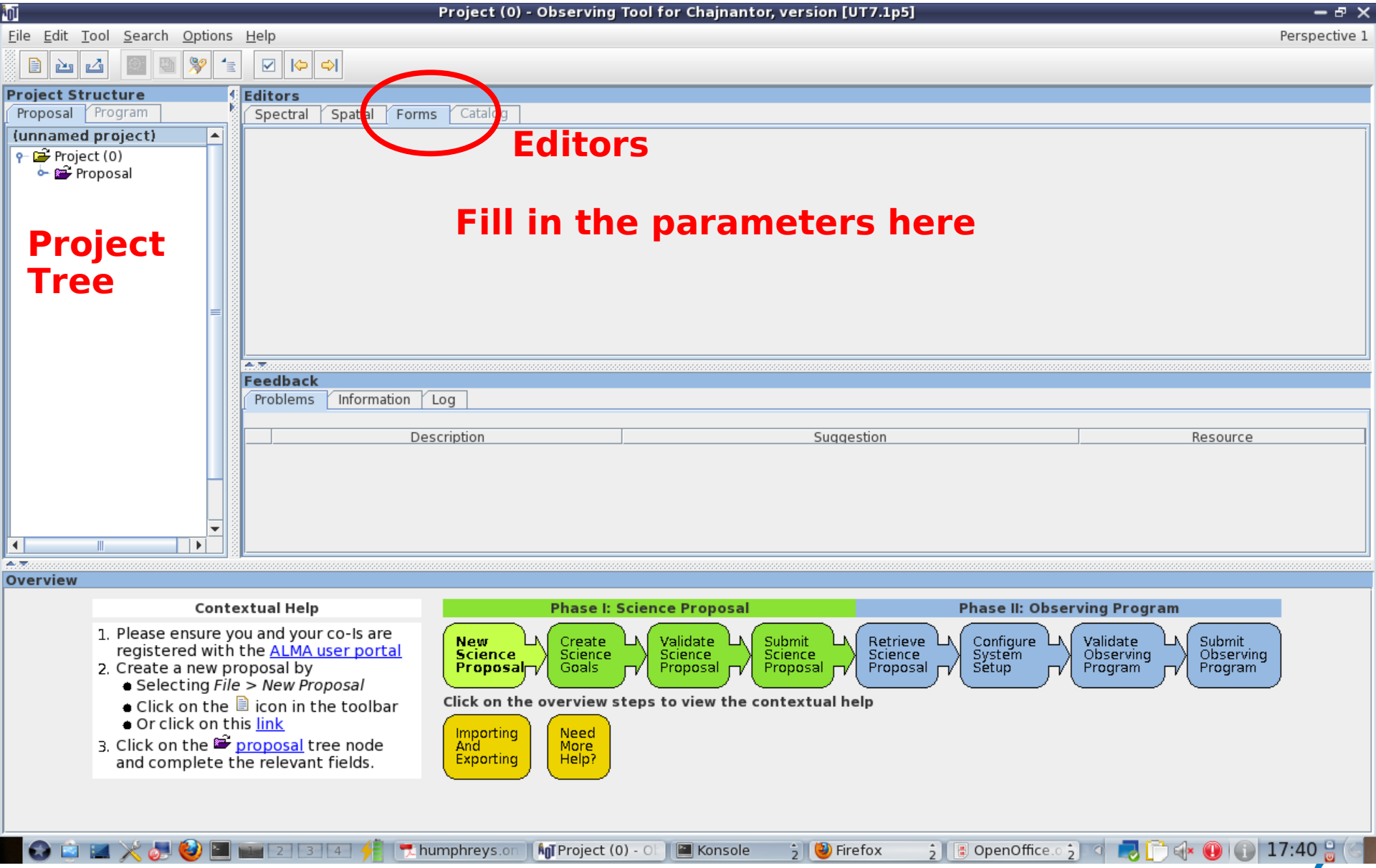
Overview


Project (0) - Observing Tool for Chajnantor, version [UT7.1p5]
File Edit Tool Search Options Help
Perspective 1
Project Structure
Proposal Program
(unnamed project)
Project (0)
Proposal
Project Tree
Editors
Spectral Spatial Forms Catalog
Feedback
Problems Information Log
Description Suggestion Resource
Overview
Contextual Help
1. Please ensure you and your co-Is are registered with the ALMA user portal
2. Create a new proposal by
Selecting File > New Proposal
Click on the icon in the toolbar
Or click on this link
3. Click on the proposal tree node and complete the relevant fields.
Phase I: Science Proposal
Phase II: Observing Program
New Science Proposal
Create Science Goals
Validate Science Proposal
Submit Science Proposal
Retrieve Science Proposal
Configure System Setup
Validate Observing Program
Submit Observing Program
Click on the overview steps to view the contextual help
Importing And Exporting
Need More Help?
humphreys.on
Project (0) - Ob
Konsole
Firefox
OpenOffice.o
17:40

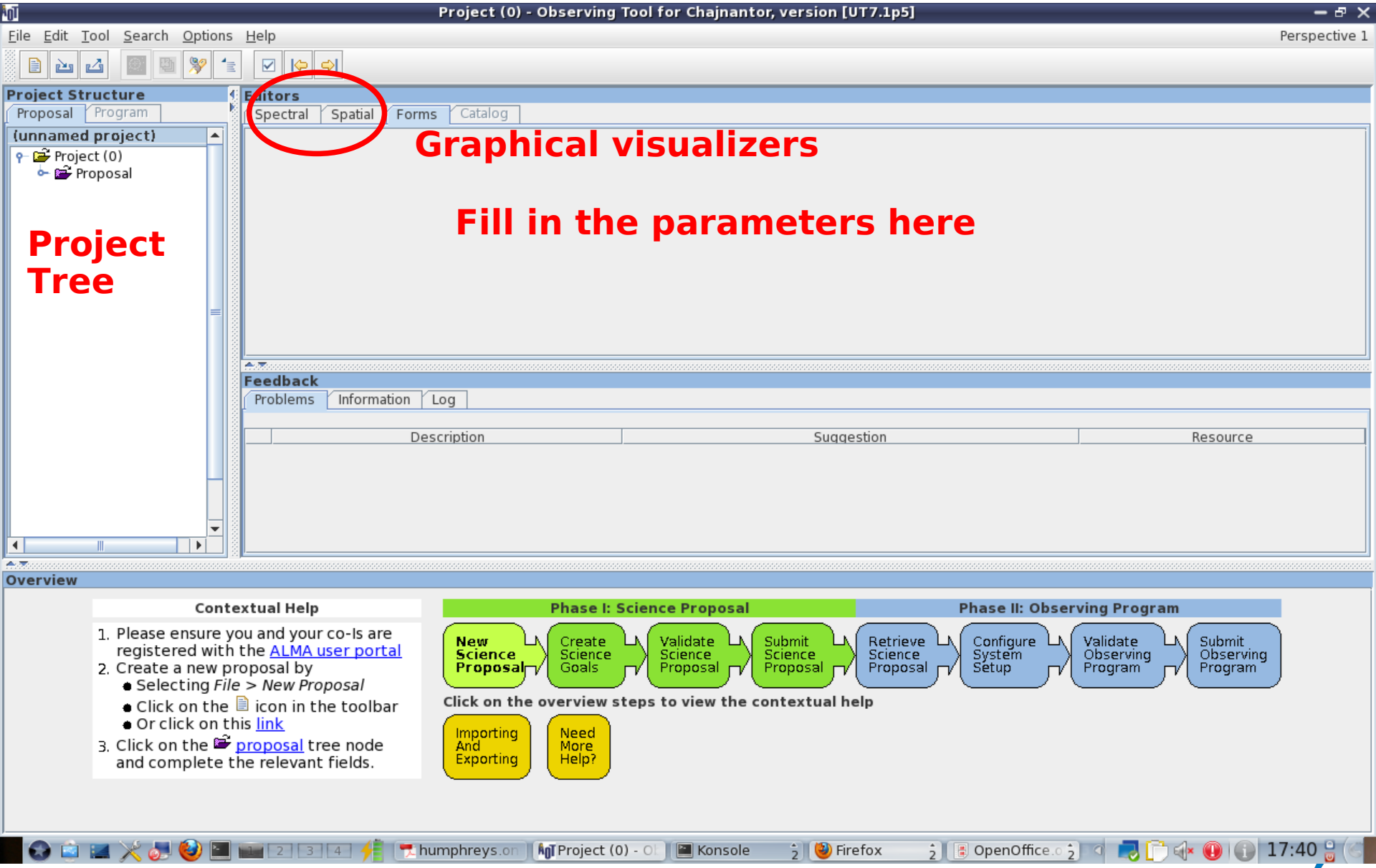
Overview


Project (0) - Observing Tool for Chajnantor, version [UT7.1p5]
File Edit Tool Search Options Help
Perspective 1
Project Structure
Proposal Program
(unnamed project)
Project (0)
Proposal
Project Tree
Editors
Spectral Spatial Forms Catalog
Fill in the parameters here
Feedback
Problems Information Log
Description Suggestion Resource
Overview
Contextual Help
1. Please ensure you and your co-Is are registered with the ALMA user portal
2. Create a new proposal by
Selecting File > New Proposal
Click on the icon in the toolbar
Or click on this link
3. Click on the proposal tree node and complete the relevant fields.
Phase I: Science Proposal
Phase II: Observing Program
New Science Proposal
Create Science Goals
Validate Science Proposal
Submit Science Proposal
Retrieve Science Proposal
Configure System Setup
Validate Observing Program
Submit Observing Program
Click on the overview steps to view the contextual help
Importing And Exporting
Need More Help?
humphreys.on
Project (0) - Ob
Konsole
Firefox
OpenOffice.o
17:40

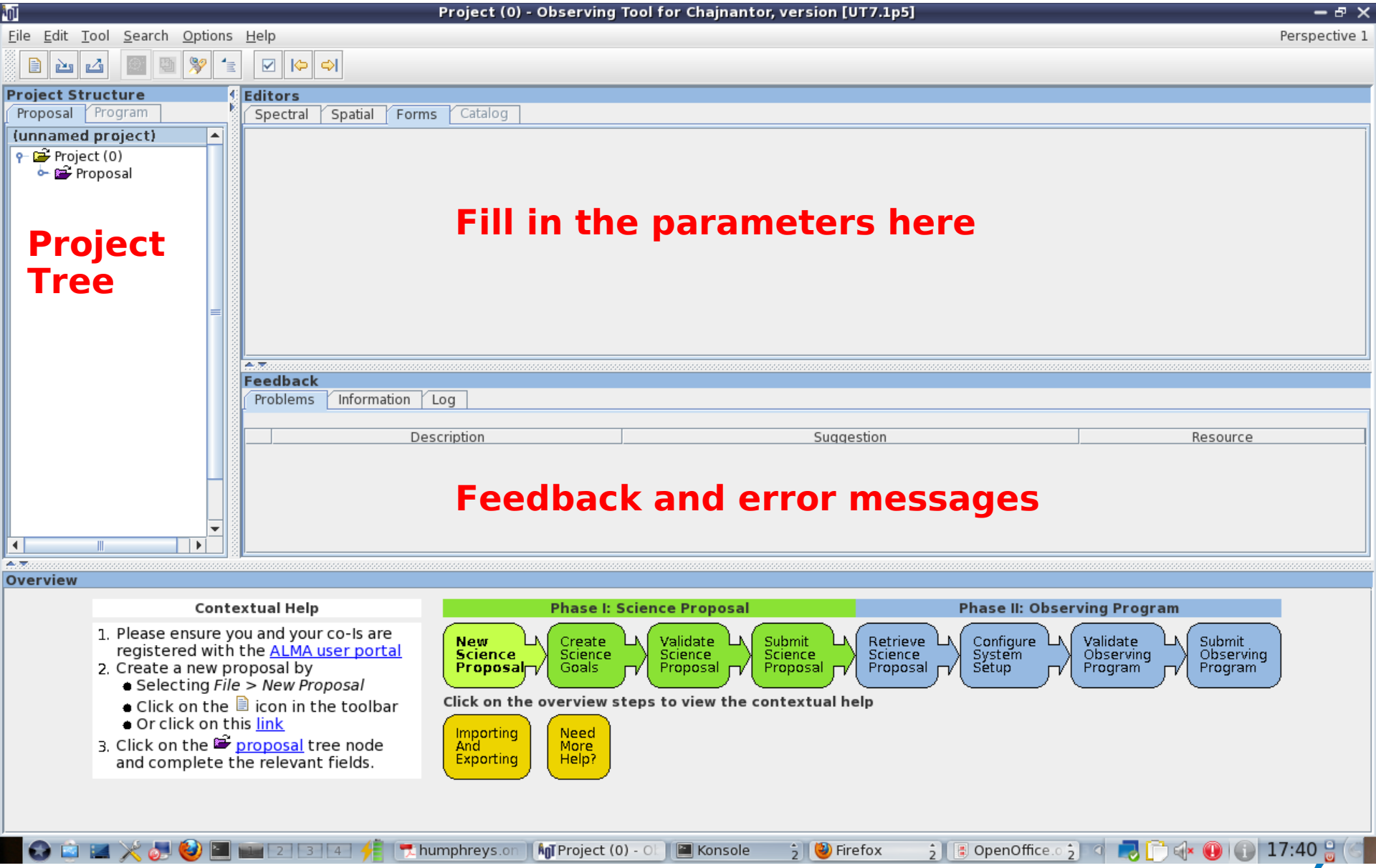
Overview


Project (0) - Observing Tool for Chajnantor, version [UT7.1p5]
File Edit Tool Search Options Help
Perspective 1
Project Structure
Proposal Program
(unnamed project)
Project (0)
Proposal
Project Tree
Editors
Spectral Spatial Forms Catalog
Editors
Fill in the parameters here
Feedback
Problems Information Log
Description Suggestion Resource
Overview
Contextual Help
1. Please ensure you and your co-Is are registered with the ALMA user portal
2. Create a new proposal by
Selecting File > New Proposal
Click on the icon in the toolbar
Or click on this link
3. Click on the proposal tree node and complete the relevant fields.
Phase I: Science Proposal
Phase II: Observing Program
New Science Proposal
Create Science Goals
Validate Science Proposal
Submit Science Proposal
Retrieve Science Proposal
Configure System Setup
Validate Observing Program
Submit Observing Program
Click on the overview steps to view the contextual help
Importing And Exporting
Need More Help?
humphreys.on
Project (0) - Ob
Konsole
Firefox
OpenOffice.o
17:40

Overview


Project (0) - Observing Tool for Chajnantor, version [UT7.1p5]
File Edit Tool Search Options Help
Perspective 1
Project Structure
Proposal Program
(unnamed project)
Project (0)
Proposal
Project Tree
Editors
Spectral Spatial Forms Catalog
Graphical visualizers
Fill in the parameters here
Feedback
Problems Information Log
Description Suggestion Resource
Overview
Contextual Help
1. Please ensure you and your co-Is are registered with the ALMA user portal
2. Create a new proposal by
Selecting File > New Proposal
Click on the icon in the toolbar
Or click on this link
3. Click on the proposal tree node and complete the relevant fields.
Phase I: Science Proposal
Phase II: Observing Program
New Science Proposal
Create Science Goals
Validate Science Proposal
Submit Science Proposal
Retrieve Science Proposal
Configure System Setup
Validate Observing Program
Submit Observing Program
Click on the overview steps to view the contextual help
Importing And Exporting
Need More Help?
humphreys.on
Project (0) - Ob
Konsole
Firefox
OpenOffice.o
17:40

Overview


Project (0) - Observing Tool for Chajnantor, version [UT7.1p5]
File Edit Tool Search Options Help
Perspective 1
Project Structure
Proposal Program
(unnamed project)
Project (0)
Proposal
Project Tree
Editors
Spectral Spatial Forms Catalog
Fill in the parameters here
Feedback
Problems Information Log
Description Suggestion Resource
Feedback and error messages
Overview
Contextual Help
1. Please ensure you and your co-Is are registered with the ALMA user portal
2. Create a new proposal by
Selecting File > New Proposal
Click on the icon in the toolbar
Or click on this link
3. Click on the proposal tree node and complete the relevant fields.
Phase I: Science Proposal
Phase II: Observing Program
New Science Proposal
Create Science Goals
Validate Science Proposal
Submit Science Proposal
Retrieve Science Proposal
Configure System Setup
Validate Observing Program
Submit Observing Program
Click on the overview steps to view the contextual help
Importing And Exporting
Need More Help?
humphreys.on
Project (0) - Ob
Konsole
Firefox
OpenOffice.o
17:40

ALMA Proposals the basics

1. **Phase I:**

- **Emphasis on the Scientific information – Define Science Goals – Limited amout of technical information**

Focus of the DEMO here. If successful Phase I application then Phase II, more for experts...

ALMA Proposals the basics

2. **Phase II: (for accepted proposals)**

- **Re-use the Science Goals of Phase I → Define a set of detailed technical information (automatically mapped from Phase I by the system but could be modified by experts)**

A list Scheduling Blocks that will directly be used to perform the Observations (typically 45 min, more for early science)

Scheduling Block

A key executable unit that contains all the information necessary for a single observation

The Execution of a SchedBlock will provide the smallest dataset consistent with a Science Goal

SchedBlocks can be repeated several times to achieve the required sensitivity (~30-45min)

Standard observing sequence

- **Bandpass calibration (strong quasars)**
- **Flux calibration (quasars, planets…)**

- **Phase/amplitude (quasars nearby the source)**
- **Science Target**
- **Phase/amplitude (quasars nearby the source)**
- **Science Target**
- **Phase/amplitude (quasars nearby the source) …**

- **Flux calibration**

Technical information

1. **Spatial Setup (source position, fov view…)**
2. **Spectral Setup (Line, continuum, velocity resolution, polarization…)**
3. **Calibration Plan (Accuracy of the calibration, special calibration…)**
4. **Requirements (sensitivity, resolution, short spacings…)**

DEMO - Outline

1. **Phase I - standard user**
   - **Define a science goal with Editors**
   - **Science Goal with Visual tools**

2. **Phase II – expert user -> possibility to modify all the parameters (directly create SBs, calibration plan…) – not in this DEMO**

Spectral Setup

1. **Band → 8 GHz (x 2polar) receivers**

2. **Baseband → To select 4x2 GHz (x 2 polar) inside the 8 GHz receiver (x2 polar) band**

3. **Spectral Windows → To sample the basebands in smaller units to achieve the required velocity resolution**

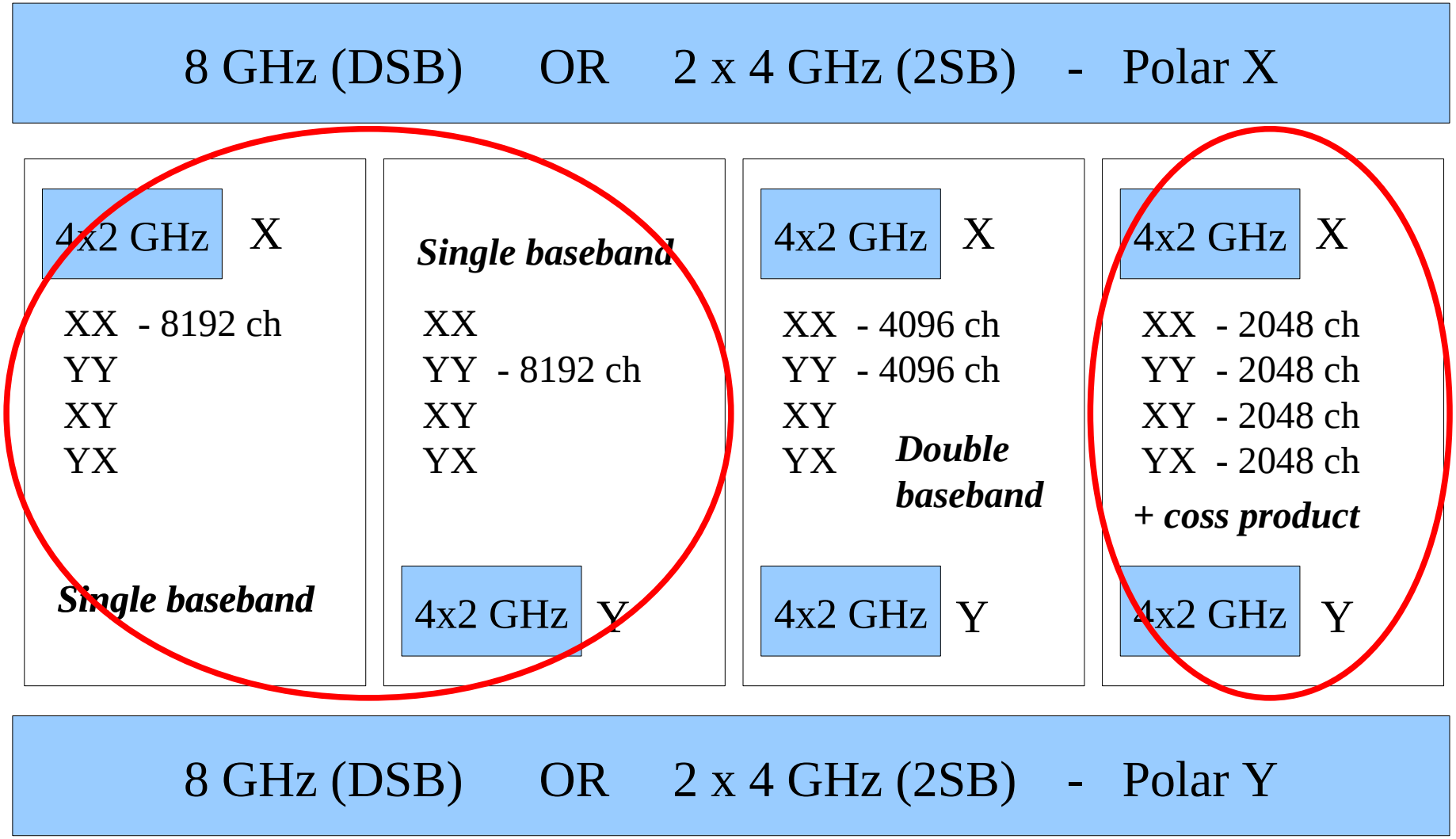
Spectral Setup

8 GHz (DSB) OR 2 x 4 GHz (2SB) - Polar X

4x2 GHz X	***Single baseband***	4x2 GHz X	4x2 GHz X
XX - 8192 ch	XX	XX - 4096 ch	XX - 2048 ch
YY	YY - 8192 ch	YY - 4096 ch	YY - 2048 ch
XY	XY	XY	XY - 2048 ch
YX	YX	YX ***Double baseband***	YX - 2048 ch
			+ coss product
Single baseband	4x2 GHz Y	4x2 GHz Y	4x2 GHz Y

8 GHz (DSB) OR 2 x 4 GHz (2SB) - Polar Y

Spectral Setup



Spectral Setup

8 GHz (DSB) OR 2 x 4 GHz (2SB) - Polar X

4x2 GHz X

XX - **8192 Max**
YY
XY
YX

31.25 MHz	62.5 MHz	125 MHz	250 MHz	500 MHz	1000 MHz	2000 MHz
8192 2048	8192 4096 2048 1024	8192 4096 2048 1024	8192 4096 2048 1024	8192 4096 2048 1024	8192 4096 2048 1024	8192 4096 2048

Standard Resolution
Single Baseband

8 GHz (DSB) OR 2 x 4 GHz (2SB) - Polar Y

Spectral Setup

8 GHz (DSB) OR 2 x 4 GHz (2SB) - Polar X

4x2 GHz X

XX - **2048 Max**
YY - **2048 Max**
XY - **2048 Max**
YX - **2048 Max**

4x2 GHz Y

31.25 MHz	62.5 MHz	125 MHz	250 MHz	500 MHz	1000 MHz	2000 MHz
2048 512	2048 1024 512 256	2048 1024 512	2048 1024	2048 1024	2048 1024	2048

Standard Resolution
Double Baseband + cross products

8 GHz (DSB) OR 2 x 4 GHz (2SB) - Polar Y

Spectral Setup

8 GHz (DSB) OR 2 x 4 GHz (2SB) - Polar X

4x2 GHz X

XX - **8192 Max**
YY
XY
YX

4x2 GHz Y

	31.25 MHz	62.5 MHz	125 MHz	250 MHz	500 MHz	1000 MHz
Full (1x)	8192	8192	8192	8192	8192	8192
1/2 (2x)	4096	4096	4096	4096	4096	4096
1/4 (4x)	2048	2048	2048	2048	2048	
1/8 (8x)	1024	1024	1024	1024		

Multi-Resolution – single baseband

8 GHz (DSB) OR 2 x 4 GHz (2SB) - Polar Y

Spectral Setup

8 GHz (DSB) OR 2 x 4 GHz (2SB) - Polar X

4x2 GHz X

XX - **2048 Max**
YY - **2048 Max**
XY - **2048 Max**
YX - **2048 Max**

4x2 GHz Y

	31.25 MHz	62.5 MHz	125 MHz	250 MHz
Full (1x)	2048	2048	2048	2048
1/2 (2x)	1024	1024	1024	1024
1/4 (4x)	512	512	512	
1/8 (8x)	256	256		

Multi-Resolution – double baseband + cross products

8 GHz (DSB) OR 2 x 4 GHz (2SB) - Polar Y

DEMO

Start the demo here

iram

OT Installation

- **JavaWebStart (JRE 6.0 from SUN required)**
- **Tarball for local installation for Linux / MacOS / Windows**
- **Documentation on :**

http://www.iram.fr/IRAMFR/ARC/tools.php?page=obsprep.php!

Development and Testing

- **Status: release 7.1 – Integrated Version 2**
- **Known Pbs, still in development**
- **Tested regularly + Integrated tests at the ATF (Socorro) and OSF (Chile)**

Credits

The OT is a software product of the ALMA ObsPrep Team, developed on the basis of the ALMA SSR (Scientific Software Requirements) and HLA (High Level Analysis) Teams

Start preparing the scientific cases …

iram