

# JCMT Observing Tool



Introduction

Tips and Tricks

# JCMT OT Introduction

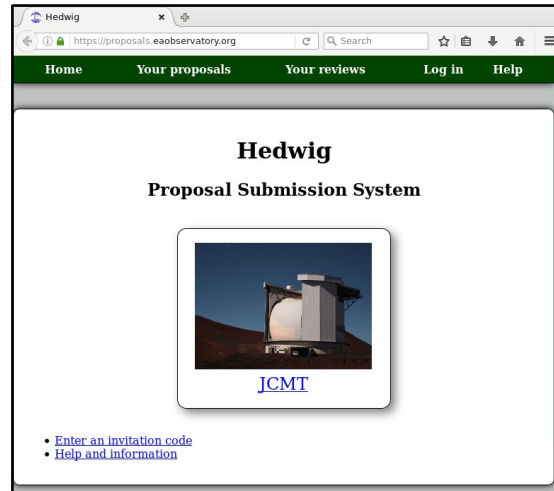
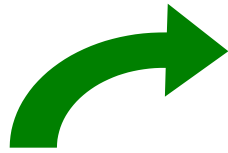
- The MSB life cycle.
- Introduction to the OT.
- The MSB libraries.
- Creating an MSB.
- Target information.
- The position editor.

# MSB life cycle — what is an MSB?

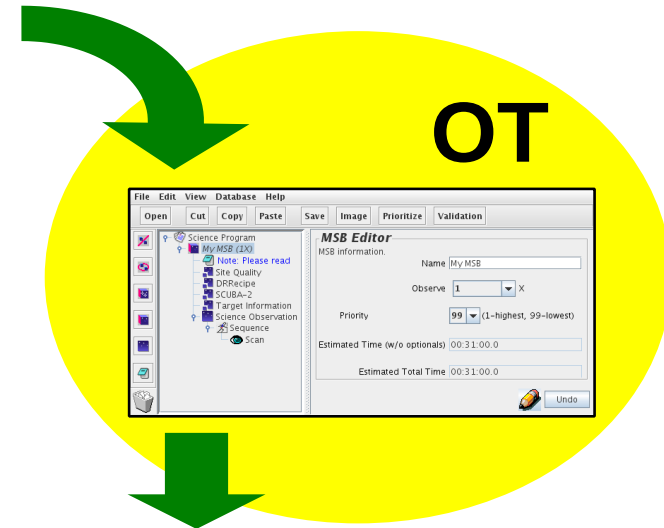
- “Minimum schedulable block”.
- Smallest useful observing unit.
  - One or more observations.
  - Typically 30 – 60 minutes.
  - Always observed in its entirety.

# MSB life cycle — role of the OT

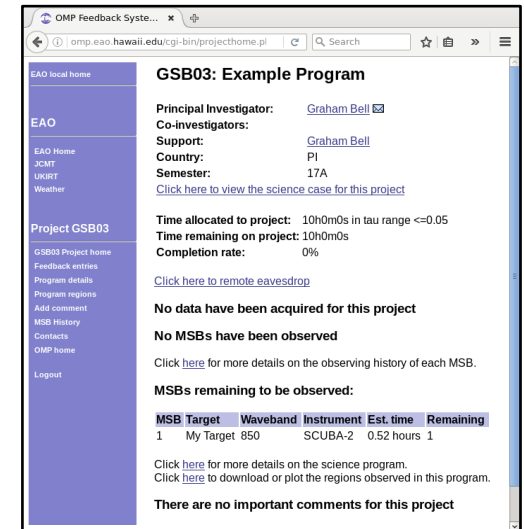
CADC



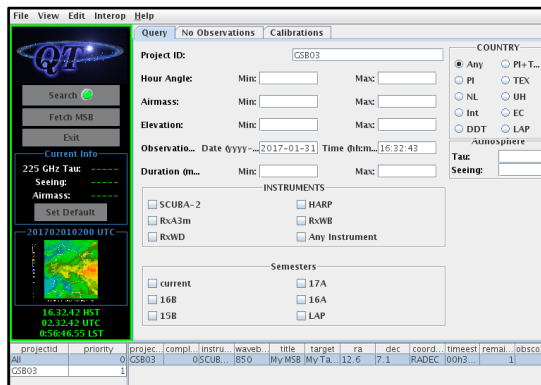
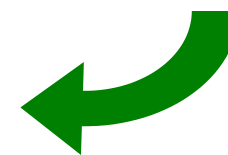
Hedwig



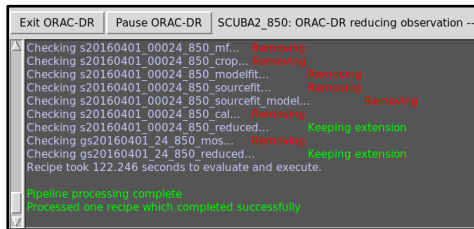
OT



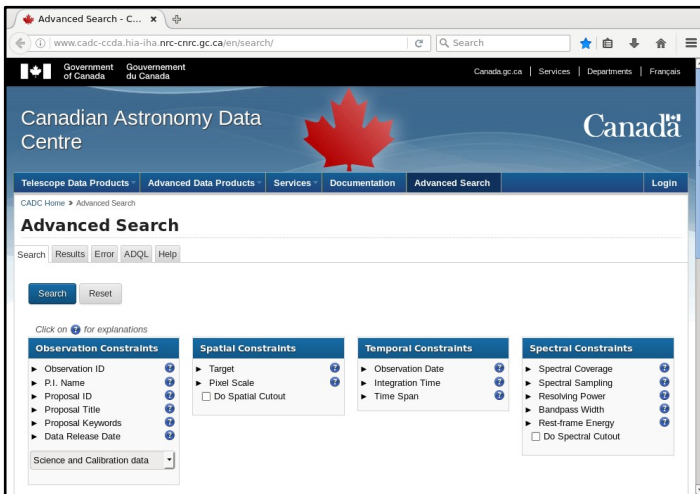
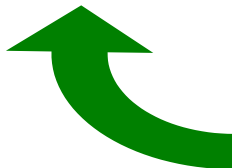
OMP



QT



ORAC-DR



# Introduction — starting the OT

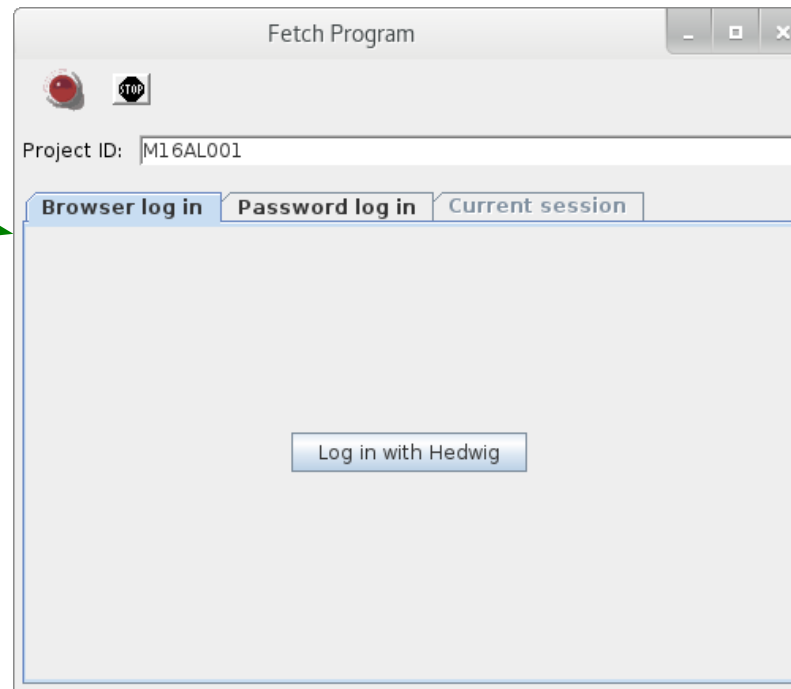
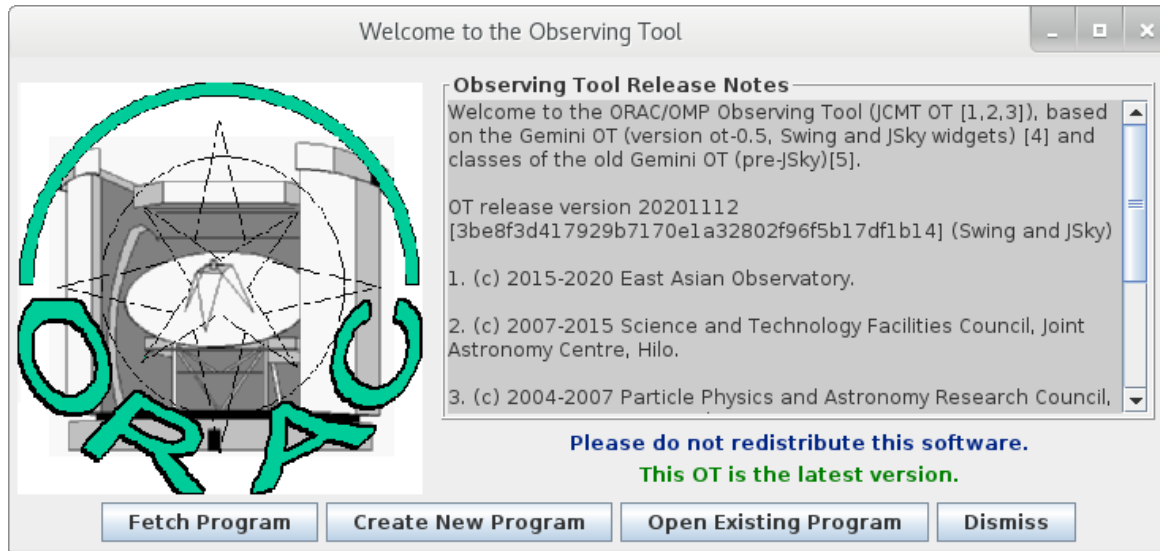
```
$ wget https://ftp.eao.hawaii.edu/ot/jcmtot.jar
```

```
$ java -jar jcmtot.jar
```

The image displays three windows from the Observing Tool (OT) application:

- Select a configuration:** A dialog box with two radio buttons. The first, "James Clerk Maxwell Telescope", is selected. The second, "United Kingdom Infrared Telescope", is unselected. Green arrows point from this dialog to the other two windows.
- OT:** The main application window, titled "OT", with a menu bar containing "File", "Observing Database", and "Help". It displays a photograph of the James Clerk Maxwell Telescope.
- Welcome to the Observing Tool:** A dialog box with a title bar "Welcome to the Observing Tool". It features the ORAC logo (a stylized telescope dome with the letters "ORAC" below it) and a text area containing "Observing Tool Release Notes". The notes include a welcome message, version information (OT release version 20201112), and a list of three copyright holders. At the bottom, there are four buttons: "Fetch Program", "Create New Program", "Open Existing Program", and "Dismiss". A warning message at the bottom reads: "Please do not redistribute this software. This OT is the latest version."

# Introduction — fetching a program



To fetch an existing program: enter project ID and log in with Hedwig.

# Introduction — components

The screenshot displays the MSB Editor application window titled "A Transient Search for Variable Protostars: How do stars gain their mass?". The interface includes a menu bar (File, Edit, View, Database, Help) and a toolbar with buttons for Open, Cut, Copy, Paste, Save, Image, Prioritize, and Validation. On the left, a vertical toolbar contains icons for various functions, including a red 'X' icon, a magnifying glass, a star, a document, a trash can, and an eye icon. The main workspace is divided into two panes. The left pane shows a hierarchical tree of components under the root "A Transient Search for V...". The tree includes "Note: for the TSS", "Note", "NGC1333 (72X)", "IC348 (73X)", "OMC2-3 (74X)", "NGC2024 (74X)", "NGC2071 (72X)", "Oph Core (79X)", "Serpens Main (56X)", and "Serpens South (71X)". The "NGC1333 (72X)" component is expanded to show sub-components: "Site Quality", "Sched. Constraint", "DRRecipe", "SCUBA-2", "Target Information", "Science Observati...", "Sequence", "Offset", and "Scan". The right pane, titled "MSB Editor", displays "MSB information." for the selected component. It includes fields for Name (NGC1333), Observe (72 X), Priority (1, with a note "(1-highest, 99-lowest)"), Estimated Time (w/o option... 00:41:33.8), and Estimated Total Time (00:41:33.8). An "Undo" button is located at the bottom right of the editor pane.

MSB

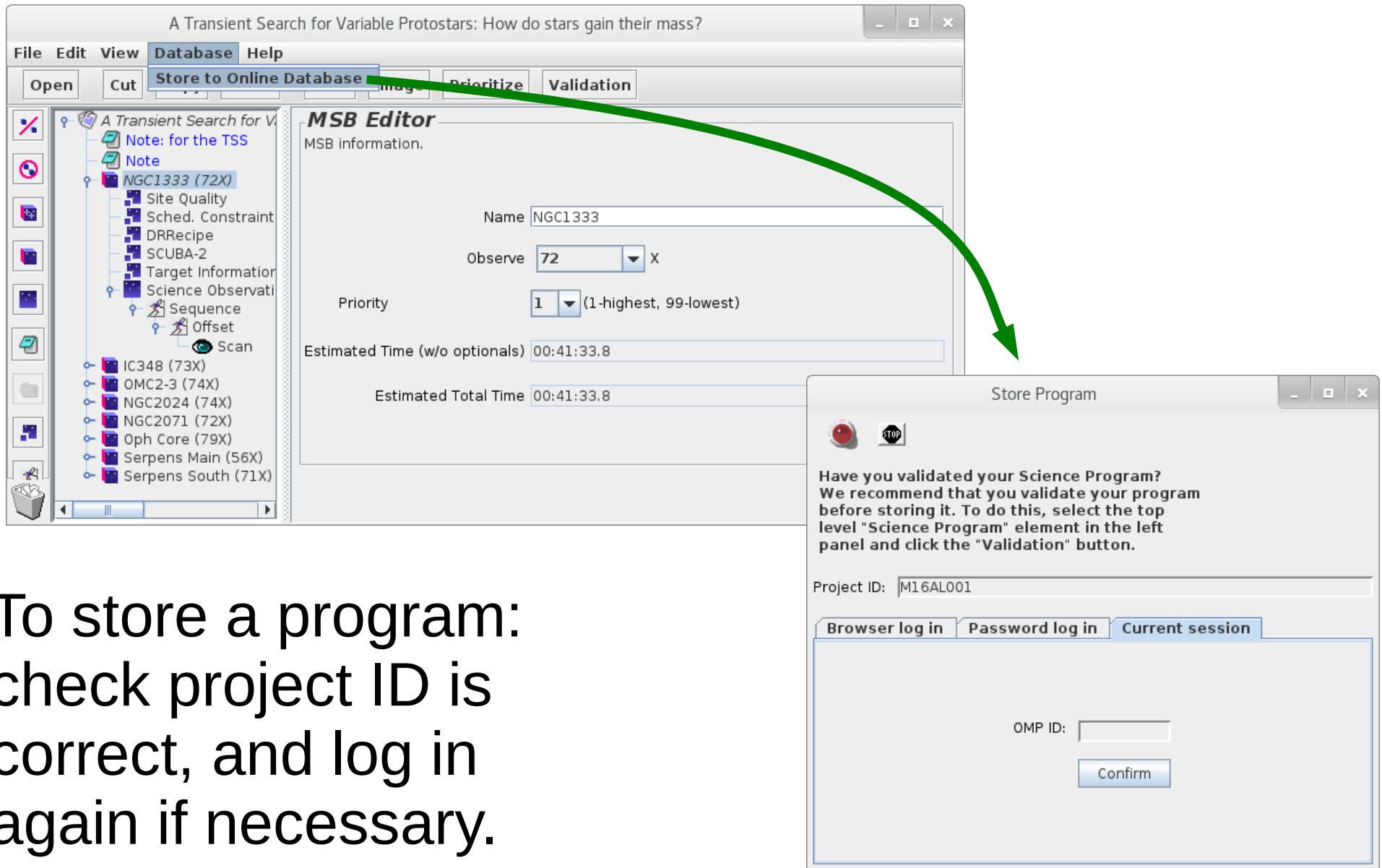
Observation

Component

Iterator

"Eye"

# Introduction — storing a program



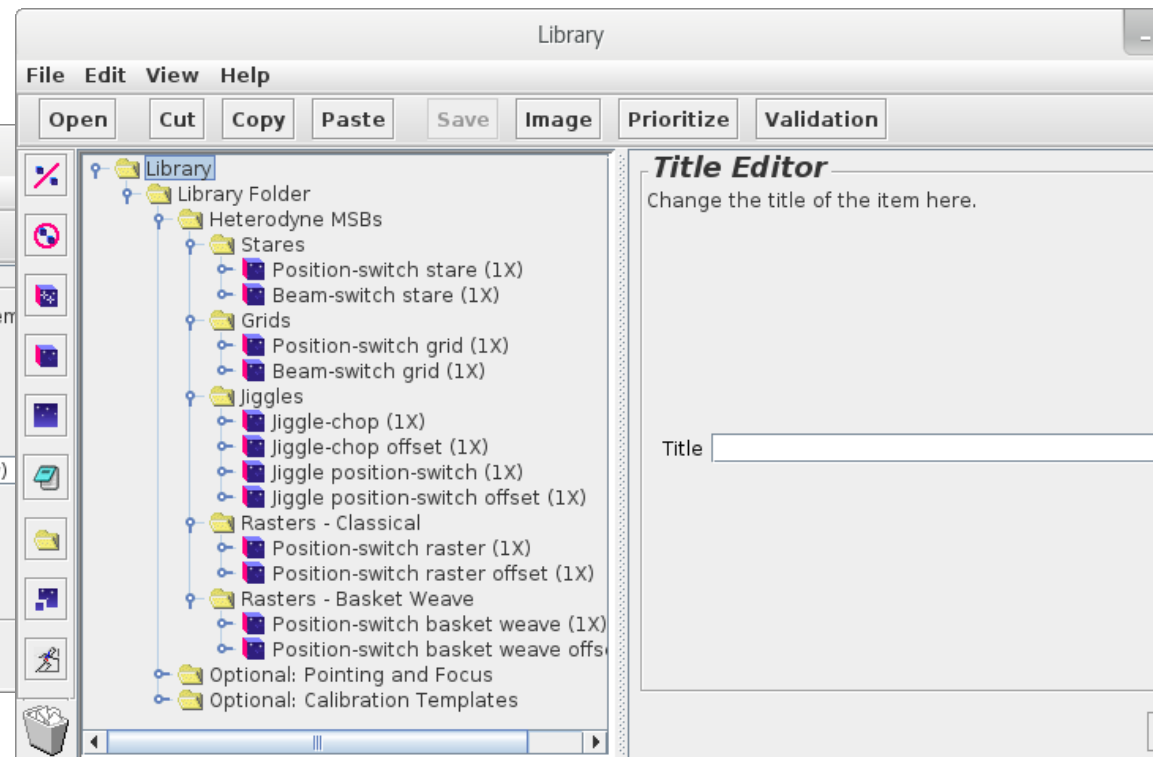
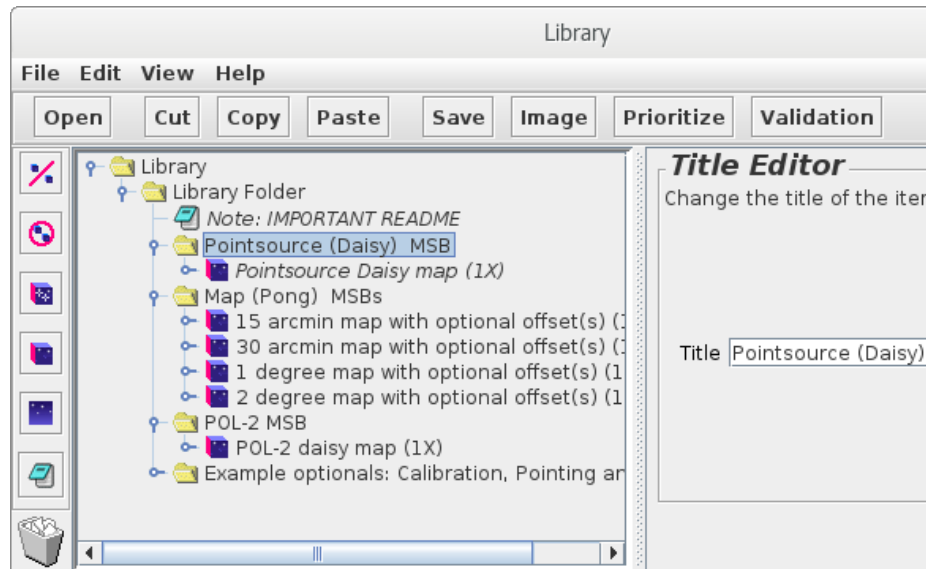
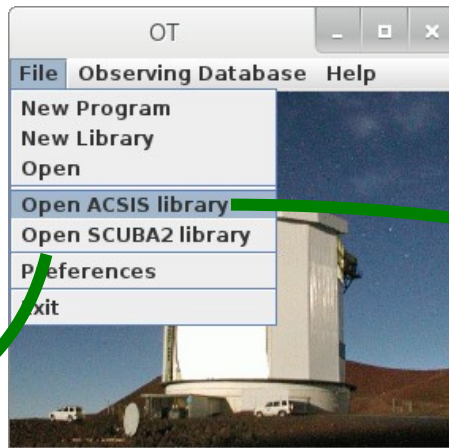
The screenshot shows the MSB Editor interface. The menu bar includes 'File', 'Edit', 'View', 'Database', and 'Help'. The 'Database' menu is open, showing options like 'Open', 'Cut', 'Store to Online Database', 'Image', 'Prioritize', and 'Validation'. The 'Store to Online Database' option is highlighted. A green arrow points from this option to a 'Store Program' dialog box. The dialog box contains a warning message: 'Have you validated your Science Program? We recommend that you validate your program before storing it. To do this, select the top level "Science Program" element in the left panel and click the "Validation" button.' Below the message is a 'Project ID' field with the value 'M16AL001'. There are three tabs: 'Browser log in', 'Password log in', and 'Current session'. The 'Current session' tab is active. Below the tabs is an 'OMP ID' field and a 'Confirm' button.

To store a program:  
check project ID is  
correct, and log in  
again if necessary.



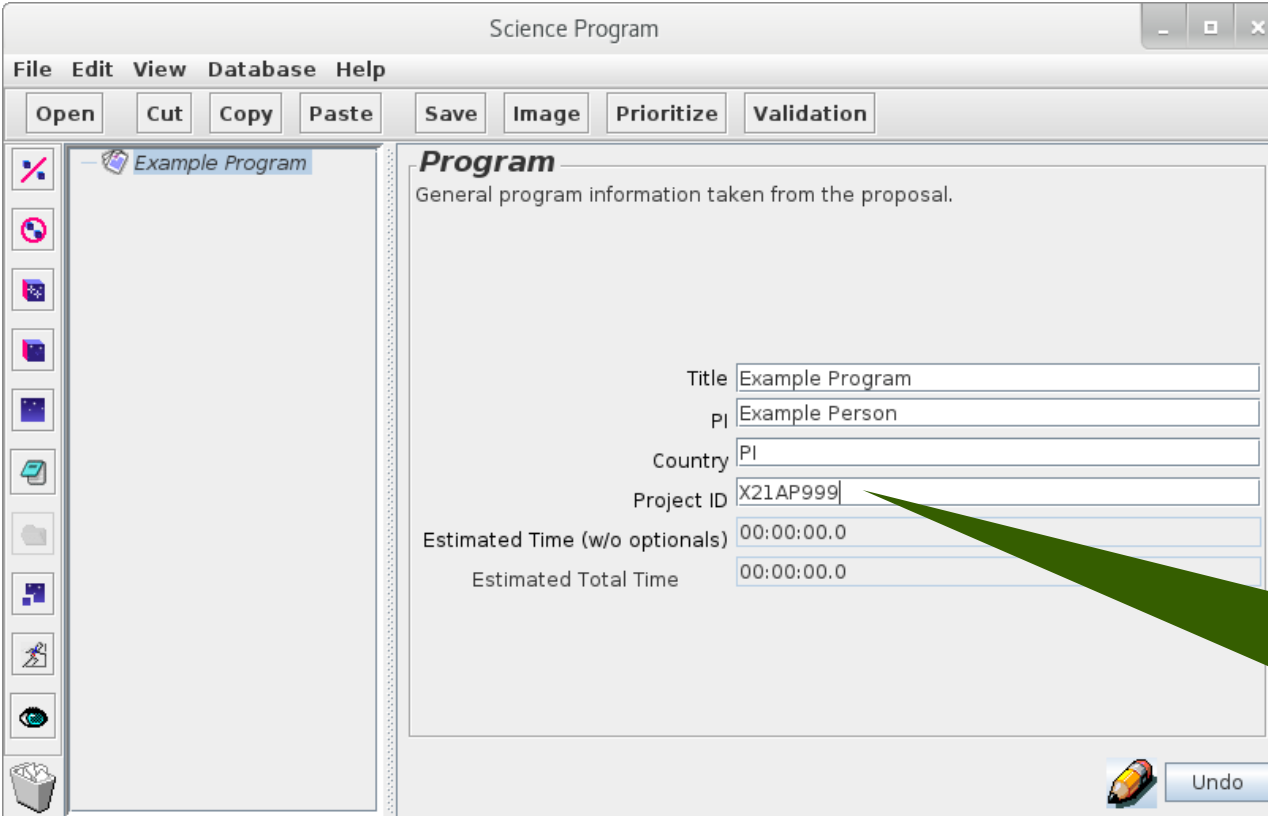
# Introduction — the MSB libraries

There are libraries of examples for ACSIS and SCUBA-2.



# Creating an MSB — the project

- A new project contains just the “program” entry.



The screenshot shows a window titled "Science Program" with a menu bar (File, Edit, View, Database, Help) and a toolbar (Open, Cut, Copy, Paste, Save, Image, Prioritize, Validation). The main area is divided into a left sidebar with icons and a right pane titled "Program" containing the following form fields:

Title	Example Program
PI	Example Person
Country	PI
Project ID	X21AP999
Estimated Time (w/o optionals)	00:00:00.0
Estimated Total Time	00:00:00.0

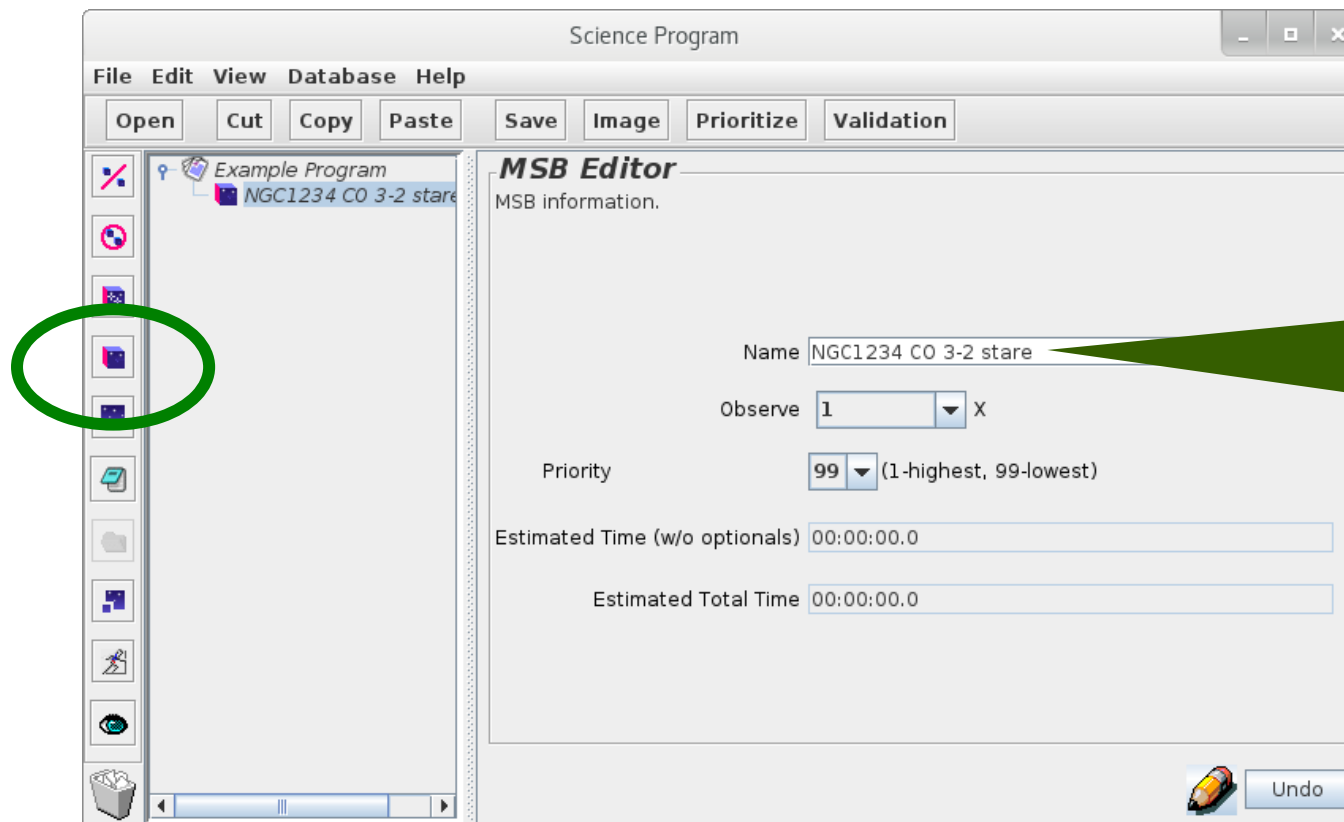
An "Undo" button is located at the bottom right of the form area.

## Project ID

Used to identify project when uploaded to the OMP.

# Creating an MSB — the MSB folder

- An MSB can be added from the toolbar.



Name

Allows you to identify  
your project's MSBs.

# Creating an MSB — the target

Science Program

File Edit View Database Help

Open Cut Copy Paste Save Image Prioritize Validation

Example Program  
NGC1234 CO 3-2 stars  
Target Information

### Target Information

Use this editor to enter the target information.

Name  TargetType

RA/Dec | Orbital Elements | Named Planets | TLE

#### Object

SIMBAD Names ESO  Resolved Name: NGC 1234

System  Ra  Dec

Radial Vel/Tracking | Proper Motion | Chop Settings

Velocity (km/s or redshift)

Frame

Tag	Name	X Axis	Y Axis	System
SCIENCE	NGC1234	03:09:39.000	-07:50:43.39	FK5 (J2000)

Add

**Name**

Ideally the common name of the target.

**Coordinates**

**Redshift or radial velocity**

**Additional coordinates**

Some types of observations require a reference position.

# Creating an MSB — the instrument

Instrument

Bandwidth

Number of spectra required

Line selection

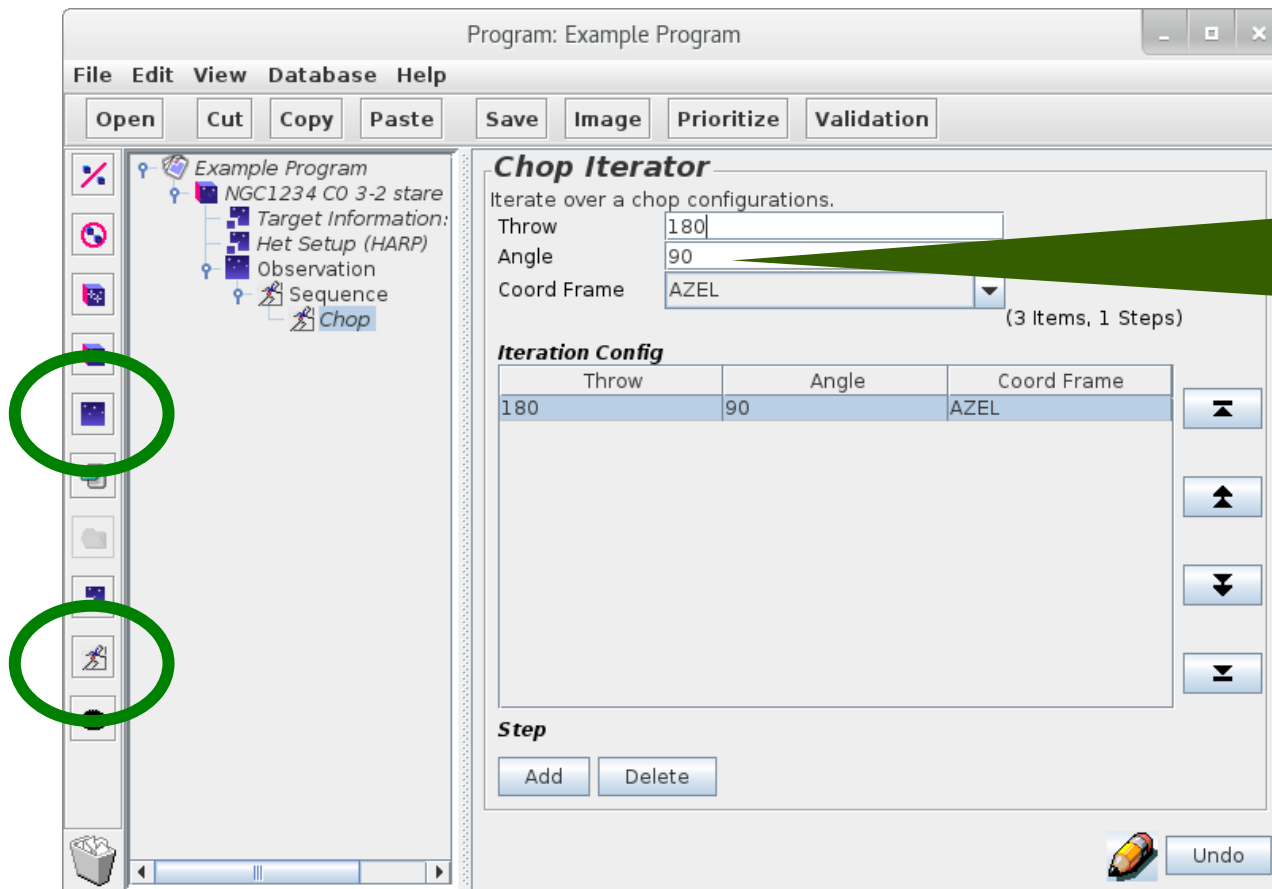
(For first spectrum.)

The screenshot shows the 'JCMT Heterodyne' configuration window. The 'Front End Configuration' section includes radio buttons for 'Uu', 'Aweoweo', 'A3m', 'A3', 'WB', 'WD', and 'HARP' (selected). The 'Sp. R...' section has radio buttons for '1', '2', '3', and '4' (selected), and a 'Special ...' dropdown set to 'None'. The 'Mode' section has radio buttons for 'ssb', 'dsb', and '2sb' (selected). The 'Side...' section has radio buttons for 'best', 'usb', and 'lsb' (selected). The 'Frequency Setup' section has a checked box for 'Default tuning velocity to target radial velocity', a 'Redshift' field with '0.0125', a 'Definition' dropdown set to 'redshift', and a 'Frame' dropdown set to 'BARYCENT'. Below this, there are dropdowns for 'CO', '3 - 2', and a frequency field set to '345.7959899' GHz. The 'Sky freq.' is '341.5' GHz. The 'Frequency Configuration' table at the bottom is as follows:

Region	Species	Trans.	Rest. F...	Centre...	BW	res	overlap	chann...
0	CO	3 - 2	345.79...	5.0E9	1.0E9	488	0.0	2048

# Creating an MSB — chop iterator

- This MSB will use beam-switching (“chopping”).
- A chop iterator is added configure chopping.



Chop settings

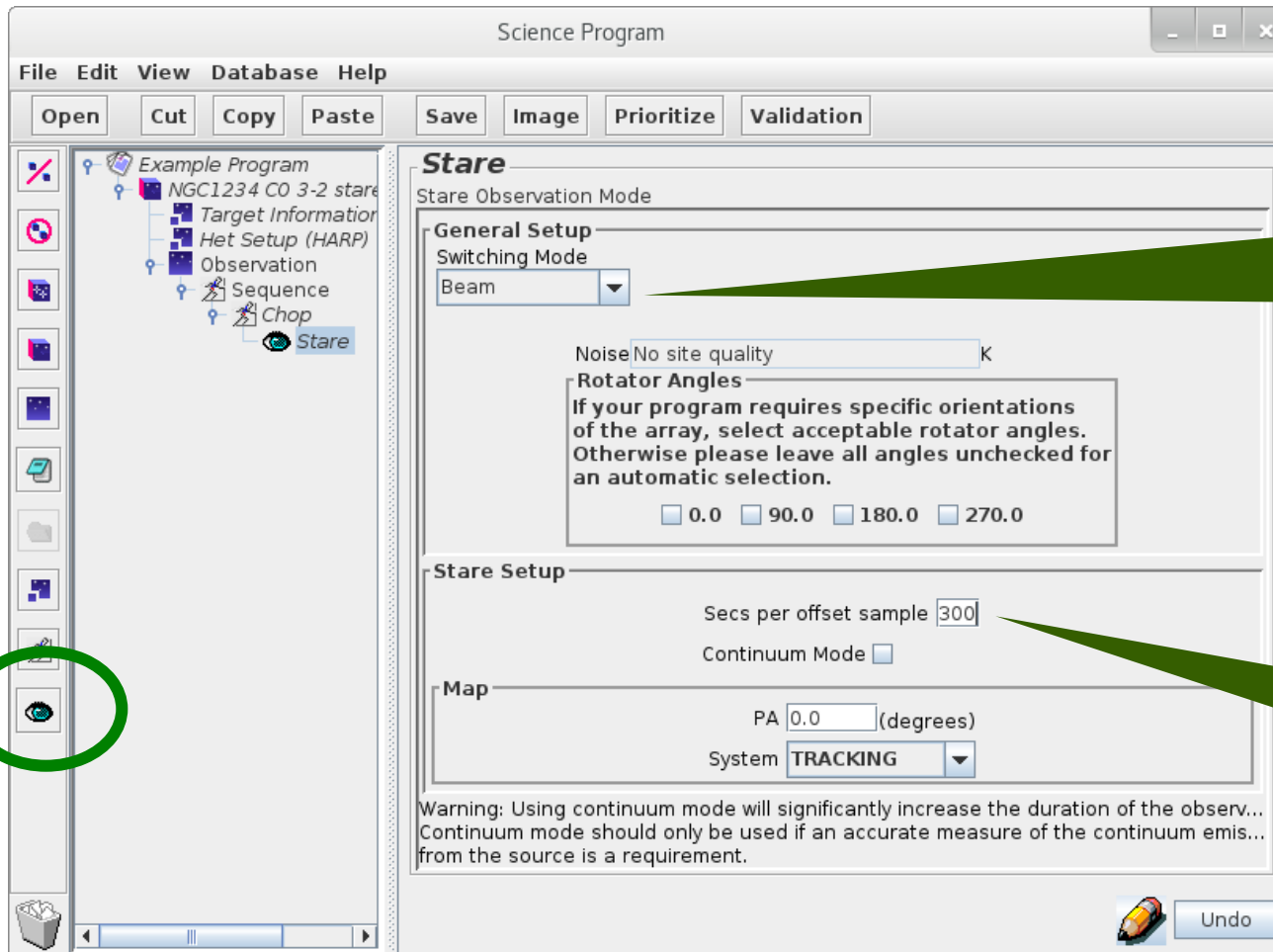
90° in Az. / El.



Chop in azimuth.

# Creating an MSB — stare eye

- An “eye” instructs the telescope to take data.



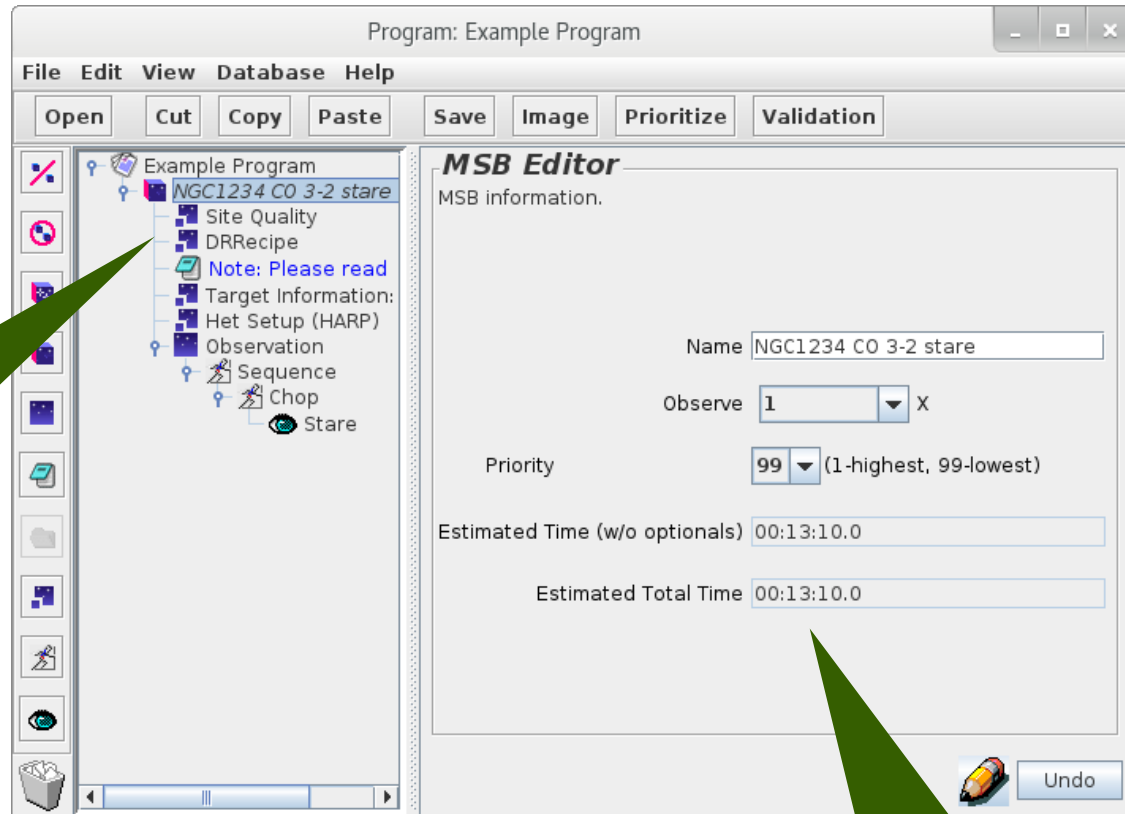
Switching mode

“Beam” switching to match use of chopping.

Time

300 seconds  
(5 minutes)

# The completed MSB



## Additional Components

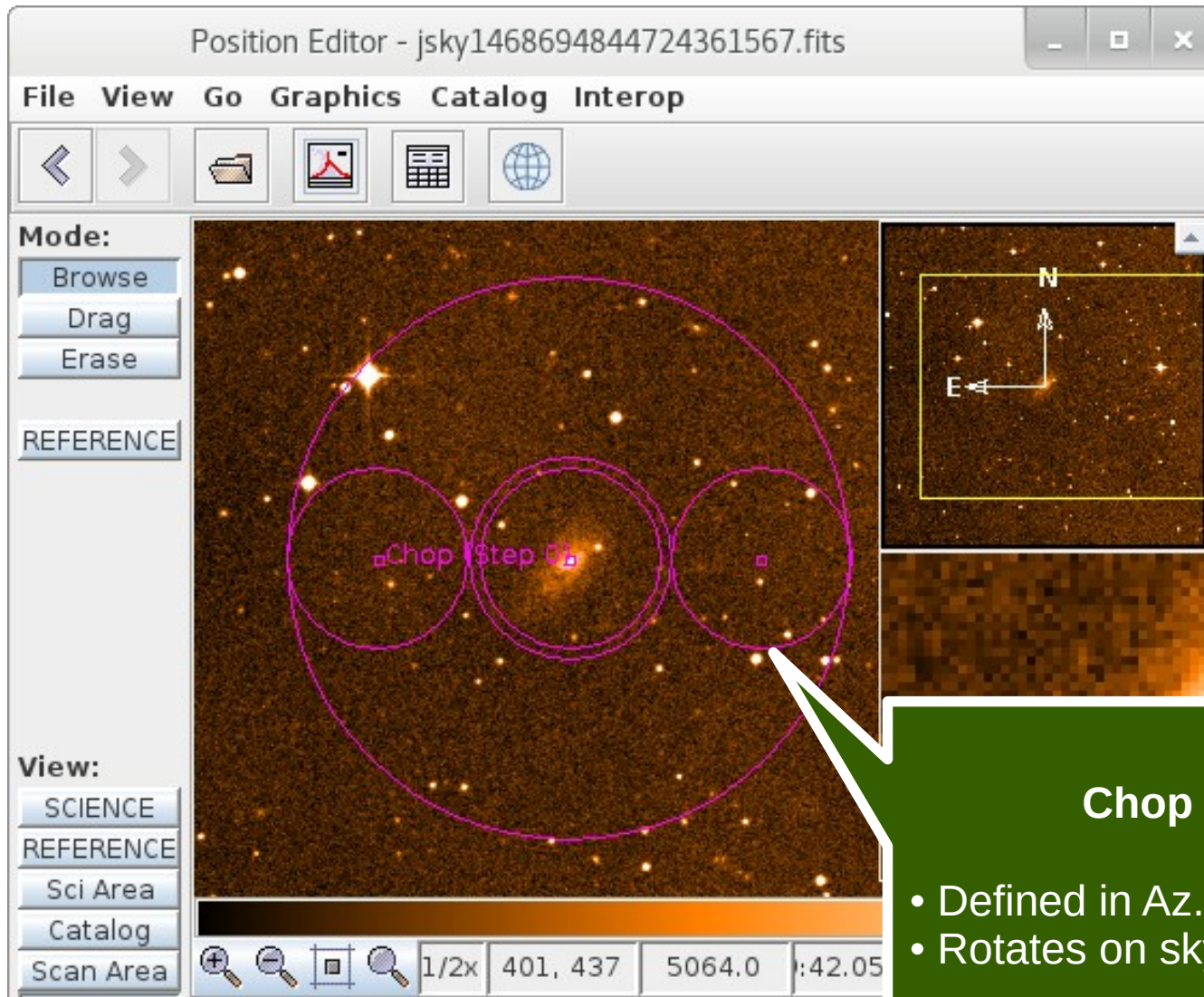
- Site Quality
- DR Recipe
- Note

## Total Time

2 × 5 minutes  
+ overhead estimate



# The completed MSB — position editor



## Chop position

- Defined in Az. / El. coordinates.
- Rotates on sky.

# Target information — tips

- Try to give the target's usual name.
  - Use the name you would want to see in the archive.
- Make use of offset iterators.
  - Define locations relative to a fixed target.

# Target information and MSB title

The screenshot shows a software interface with a menu bar (File, Edit, View, Database, Help) and a toolbar (Open, Cut, Copy, Paste, Save, Image, Prioritize, Validation). On the left is a tree view of a project structure. A green oval highlights the entry "Standard: CRL618 (1X)" in the tree. A green callout box points to this entry with the text "MSB Title Use this for your own identification of the MSB." On the right is a "Target Information" dialog box. A green oval highlights the "Name" field, which contains "CRL618". A green callout box points to this field with the text "Target Name Give the name you would wish to see used in the archive." Below the "Name" field are tabs for "RA/Dec", "Orbital Elements", "Named Planets", and "TLE". The "Object" section includes "SIMBAD Names ESO" and "Resolve Name" buttons. The "System" dropdown is set to "FK5 (J2000)". The "Radial Vel/Tracking" section has "Velocity (km/s or redshift)" set to "radio" and "0.0", and "Frame" set to "LSRK". At the bottom is a table with columns "Tag", "Name", "X Axis", "Y Axis", and "System".

Tag	Name	X Axis	Y Axis	System
SCIENCE	CRL618	04:42:53.672	+36:06:53.17	FK5 (J2000)

Buttons at the bottom: Plot..., Set SCIENCE..., Remove, Add, REFERE..., Undo.

# Target information — FITS headers

**Target Information**

Use this editor to enter the target information.

Name  Tag  TargetType

**Object**

Resolved Name:

```
MSBTITLE= 'Standard:CRL618' / Title of minimum schedulable block
OBJECT   = 'CRL618'         / Object of interest
```

Add

# Target information — CADC

Image Prioritize Validation

### Target Information

Use this editor to enter the target information.

Name  Tag

RA/Dec  Orbital Elements Named Planets

#### Object

SIMBAD Names ESO  Resolve Name

System  Ra  Dec

Radial Vel/Tracking Proper Motion Chop Settings

Velocity (km/s or redshift)

Frame

Tag	Name	X Axis
SCIENCE	CRL618	04:42:53.672

## Canadian Astronomy Data Centre

Telescope Data Products ▾ Advanced Data Products ▾ Services ▾ Documentation

CADC Home ▸ Advanced Search

### Advanced Search

Search Results Error ADQL Help

Download complete query results: [VOTable](#) [CSV](#) [TSV](#)

Showing 47 rows (47 before filtering).

Mark	Preview	Target Name	RA (J2000.0)	Dec. (J2000.0)	Proposal ID
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="H:M:S"/>	<input type="text" value="D:M:S"/>	<input type="text"/>
<input type="checkbox"/>	<a href="#">Preview</a>	<a href="#">CRL618</a>	04:42:55.98	+36:07:39.2	<a href="#">JCMTCAL</a>
<input type="checkbox"/>	<a href="#">Preview</a>	<a href="#">CRL618</a>	04:42:57.34	+36:07:31.2	<a href="#">JCMTCAL</a>
<input type="checkbox"/>	<a href="#">Preview</a>	<a href="#">CRL618</a>	04:42:55.82	+36:07:46.7	<a href="#">JCMTCAL</a>
<input type="checkbox"/>	<a href="#">Preview</a>	<a href="#">CRL618</a>	04:42:56.43	+36:07:37.7	<a href="#">JCMTCAL</a>

This is how the observation will appear in the search interface at CADC.

# Position editor — tips

- This can be used to visualize part of an MSB.
  - Scan areas.
  - Reference and offset positions.
- Common pitfalls.
  - Only shows the currently selected component.
  - Plotting tool only supports some projections.



# Position editor — scan area

The screenshot displays the 'Position Editor' software interface. The main window shows a plot of a scan area with a central green crosshair labeled 'Base position' and a green square labeled 'REFERENCE'. A vertical white rectangle highlights the scan area. The interface includes a menu bar (File, View, Go, Graphics, Catalog, Interop), a toolbar, and a 'Mode' section with buttons for 'Browse', 'Drag', 'Erase', and 'REFERENCE'. A 'View' section has buttons for 'SCIENCE', 'REFERENCE', 'Sci Area', 'Catalog', and 'Scan Area'. The 'Scan Area' button is highlighted. A status bar at the bottom shows coordinates: '3.0 | 12:39:38.650, -11:40:11.12 (J2000)'. A separate window on the left shows a tree view with 'Scan' circled in green.

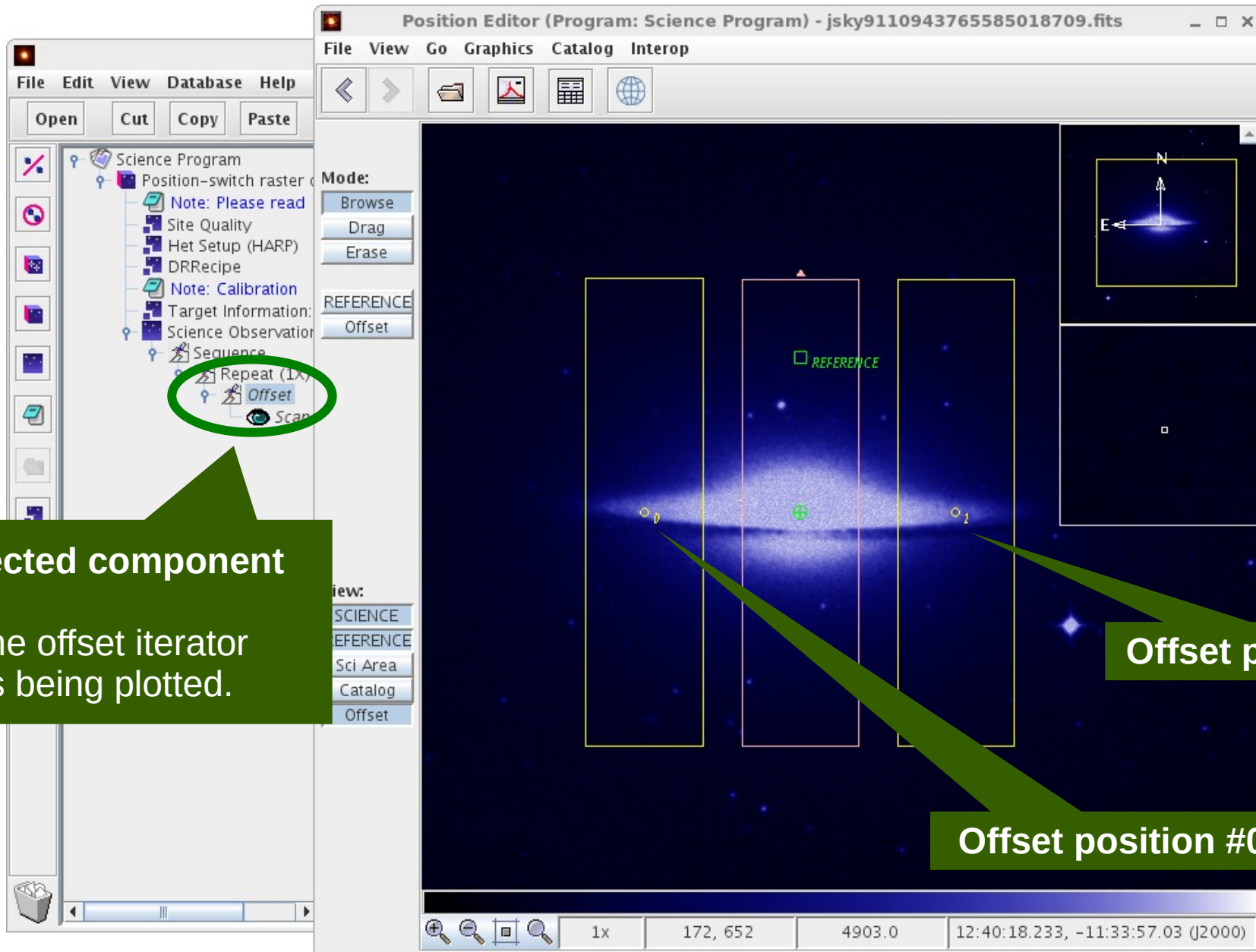
**Selected component**  
The scan area is being plotted.

**Reference**

**Base position**

**Feature selection**  
Controls what is plotted.

# Position editor — offset iterator



**Selected component**

The offset iterator  
is being plotted.

**Offset position #1**

**Offset position #0**



# JCMT OT Tips and Tricks

- Aims
  - Simplify science programs.
  - Avoid mistakes, e.g. copy & paste errors.
- OT features
  - Inheritance.
  - Folders.
  - Survey containers.
  - Validation.
  - Common pitfalls.

# Inheritance — tips

- Science programs are hierarchical:
  - ◆ Top level
    - ➔ Folder
      - ➔ MSB
        - ➔ Observation
- Observations inherit options from parents.
  - Instrument, target, site quality, DR recipe, notes.

# Inheritance — example

The screenshot shows a software interface with a menu bar (File, Edit, View, Database, Help) and a toolbar (Open, Cut, Copy, Paste, Save, Image, Prioritize, Validation). The main area is divided into two panes. The left pane displays a hierarchical tree of components under the heading "Example program". The tree structure is as follows:

- Example program
  - Note: Please read
  - Site Quality
  - DRRecipe
  - SCUBA-2
  - First MSB (1X)
    - Target Information: NGC 1234
    - Science Observation
      - Sequence
      - Scan
  - Second MSB (1X)
    - Target Information: NGC 2345
    - Science Observation
      - Sequence
      - Scan

The right pane is titled "JCMT SCUBA-2" and contains the text: "The SCUBA-2 instrument is configured with this component." An "Undo" button is located at the bottom right of the right pane.

Green arrows and a bracket highlight the inheritance relationship. A bracket groups the "Site Quality", "DRRecipe", and "SCUBA-2" components. An arrow points from this group to the "Science Observation" component under "First MSB (1X)". Another arrow points from the "Science Observation" component under "First MSB (1X)" to the "Science Observation" component under "Second MSB (1X)".

**Inherited Options**  
MSBs inherit options from parent containers.

# Target information without inheritance

**Target Information**

Use this editor to enter the target information.

Name  Tag  TargetType

Object

Resolved Name:

System  Ra

Dec

Radial Vel/Tracking Proper Motion Chop Settings

Velocity (km/s or redshift)

Frame

System

FK5 (J2000)

Add

## Bad Example

- Individual targets in each MSB.
  - *Define 3 positions along a source.*
- Personal target names.
- Uninformative MSB titles.

# Inheritance — target information

Example Program

- Note: Please read
- Site Quality
- DRRecipe
- SCUBA-2
- 1 degree map (1X)
  - Target Information: Field 1
  - Science Observation
    - Sequence
    - Scan
- 1 degree map (1X)
  - Target Information: Field 2
  - Science Observation
    - Sequence
    - Scan
- 1 degree map (1X)
  - Target Information: Field 3
  - Science Observation
    - Sequence
    - Scan

Target Information

File Edit View Database Help

Open Cut Copy Paste

Example Program

- Note: Please read
- Site Quality
- DRRecipe
- SCUBA-2
- Target Information: IC 3521
- Field 1 (1X)
  - Science Observation
    - Sequence
    - Offset
    - Scan
- Field 2 (1X)
  - Science Observation
    - Sequence
    - Offset
    - Scan
- Field 3 (1X)
  - Science Observation
    - Sequence
    - Offset
    - Scan

- Personalized MSB titles.
- Offsets for position of each MSB.
  - Avoid having to manually compute offset positions.

## Better Example

- Standard target name.
- Shared target component.
- Same base position for each MSB:
  - ORAC-DR should automatically co-add maps.

(arcsec)

	#	p Offset	q Offset
p	0	0.0	3600.0
q			

PA 0.0

Display Derotated Offsets

Grid Pattern

Overwrite  Append

Initial Offset (arcsec)	Spacing (arcsec)	Rows	Cols
p 0	p 60		
q 0	q 60		

Create/Centre On Base

Set Spacing from Scan

# Inheritance — notes

The screenshot shows a software interface with a menu bar (File, Edit, View, Database, Help) and a toolbar (Open, Cut, Copy, Paste, Save, Image, Prioritize, Validation). On the left is a tree view under 'Example Program' containing:

- Note: Top level note
- Pointsource Daisy map (1X)
  - Note: 1st MSB note
  - Note: 2nd MSB note
  - Site Quality
  - DRRecipe
  - SCUBA-2
  - Target Information: Venus
  - Science Observation

The right pane is titled 'Note' and contains the text 'Enter notes for the operator/astronomer here.' Below this is a 'Title' field with the value 'Top level note'. A green circle highlights a checked checkbox labeled 'Show to the Observer'. Below the checkbox are fields for 'Completion Parameter' (with a value of 'S/N = 5 / allocatedtime expires ...') and 'Binning' (with a value of '(specify units of MHz or Km/s for...'). At the bottom of the right pane is a 'Note' text area containing the text 'This is a note at the top of the science program.' and an 'Undo' button.

Multiple "Show to the Observer" notes.



# Inheritance — warnings

- Parent options **after** the MSB are included too.
- Some components need to be able to find other components:
  - DR recipe must be at same or lower level than instrument.
  - Heterodyne setup must be at same or lower level than target information when using target's radial velocity.

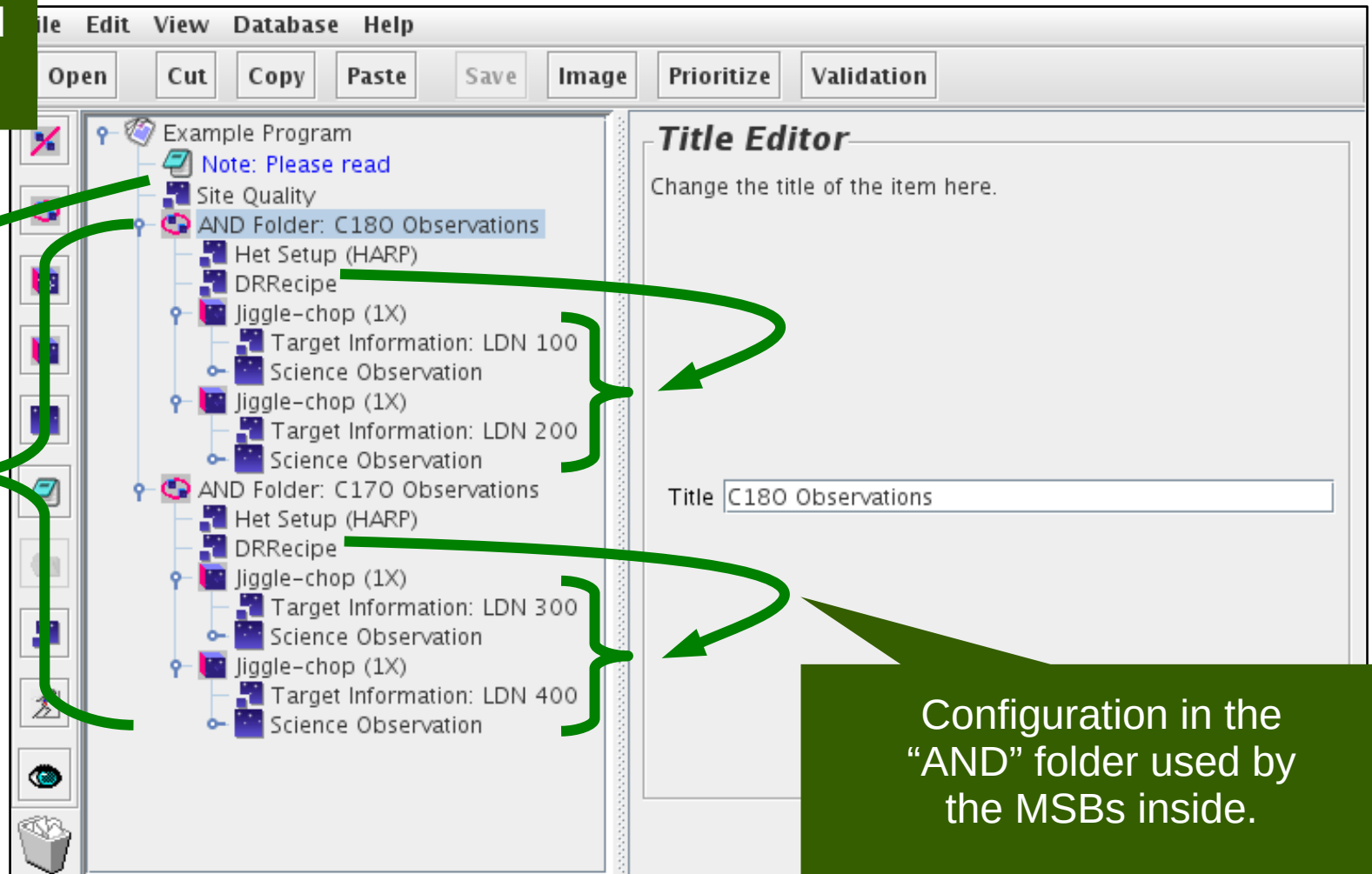


# Folders

- “AND” folders
  - Organize MSBs into groups.
- “OR” folders
  - Select from alternative MSBs.

# “AND” folders

Configuration at the top level used by all MSBs.



Configuration in the “AND” folder used by the MSBs inside.

“AND” folders do not affect when MSBs are observed.

# “OR” folders

The screenshot shows a software interface with a menu bar (File, Edit, View, Database, Help) and a toolbar (Open, Cut, Copy, Paste, Save, Image, Prioritize, Validation). The left pane displays a tree view of an 'Example Program' containing various folders and files. The right pane is titled 'Or Folder Editor' and contains the text 'The or folder can be configured here.' Below this text is a 'Title' field with the value 'Possible planets to observe' and a 'Select' dropdown menu currently set to '2 items'. A green circle highlights the 'Select 2 items' dropdown menu.

## Original Program

- 5 different MSBs
- Want to do 2 of them (“Select” 2)
- 5 observations each (5X)

# “Or” folders — during selection

The screenshot shows a software interface with a menu bar (File, Edit, View, Database, Help) and a toolbar (Open, Cut, Copy, Paste, Save, Image, Prioritize, Validation). The main window displays a tree view of folders and items. An 'OR Folder: Possible planets to observe (1)' is selected, containing items for Venus, Mars, Saturn, and Uranus. A 'Beam-switch sample: Jupiter (4X)' is circled in green and moved outside the OR folder. A callout box indicates the 'Select' counter is now 1. Another callout box explains that the MSB has been observed, moved outside the OR folder, and the observe counter decreased to 4.

**“Select” counter decreased to 1.**

Select 1 items

- **This MSB has been observed.**
- MSB moved outside OR folder.
- Observe counter decreased to 4.

# “Or” folders — after selection

The screenshot shows the 'Or Folder Editor' window. The main tree view displays a hierarchy of folders under 'Example Program'. The 'OR Folder: Possible planets to observe (0)' folder is selected. The configuration panel on the right shows the title 'Possible planets to observe' and a 'Select' counter set to '0 items'. A green circle highlights the '0' in the counter, and a green callout box points to it with the text: '“Select” counter now at 0. No more MSBs will be chosen.' Another green callout box points to the '4X' multiplier on the 'Saturn' and 'Jupiter' items in the tree view, with the text: '2 MSBs have now been observed. Selected MSBs outside folder. They will be completed (4X more each).'

File Edit View Database Help

Open Cut Copy Paste Save Image Prioritize Validation

Example Program

- Note: Please read
- Site Quality
- Het Setup (HARP)
- DRRecipe
- OR Folder: Possible planets to observe (0)
- Beam-switch sample: Venus (REMOVED)
- Target Information: Venus
- Science Observation
- Beam-switch sample: Mars (REMOVED)
- Target Information: Mars
- Science Observation
- Beam-switch sample: Uranus (REMOVED)
- Target Information: Uranus
- Science Observation
- Beam-switch sample: Saturn (4X)
- Target Information: Saturn
- Science Observation
- Beam-switch sample: Jupiter (4X)
- Target Information: Jupiter
- Science Observation

File Edit View Database Help

Open Cut Copy Paste Save Image Prioritize Validation

Example Program

- Note: Please read
- Site Quality
- Het Setup (HARP)
- DRRecipe
- OR Folder: Possible planets to observe (0)
- Beam-switch sample: Venus (REMOVED)
- Target Information: Venus
- Science Observation
- Beam-switch sample: Mars (REMOVED)
- Target Information: Mars
- Science Observation
- Beam-switch sample: Uranus (REMOVED)
- Target Information: Uranus
- Science Observation
- Beam-switch sample: Saturn (4X)
- Target Information: Saturn
- Science Observation
- Beam-switch sample: Jupiter (4X)
- Target Information: Jupiter
- Science Observation

Or Folder Editor

The or folder can be configured here.

Title Possible planets to observe

Select 0 items

- “Select” counter now at 0.
- No more MSBs will be chosen.

- 2 MSBs have now been observed.
- Selected MSBs outside folder.
- They will be completed (4X more each).

# Survey containers

- Repeat an observation for multiple sources.
- Source list can be loaded from a file.

# Survey container — example

The screenshot shows a software interface with a menu bar (File, Edit, View, Database, Help) and a toolbar (Open, Cut, Copy, Paste, Save, Image, Prioritize, Validation). On the left, a tree view shows a hierarchy: Example Program > SCUBA-2 > Site Quality > Survey Container: Some galaxies > Pointsource Daisy map (1X) > DRRecipe > Note: Please read > Science Observation > Sequence > Scan. A green arrow points from the 'Survey Container' node to a green callout box. The callout box contains the text: 'MSB inside Survey Container. Means: make a copy of this MSB for each target.'

The main window displays 'Survey Information' with the instruction: 'Use this editor to enter the survey information.' The title is 'Some galaxies'. Below this, there are two tabs: 'Survey Targets' (selected) and 'Target Information'. The 'Survey Targets' tab contains a table with the following data:

Name	X Axis	Y Axis	Coord System	Rema...	Priority
M31	00:42:44.330	+41:16:07.50	FK5 (J2000)	5	1
M32	00:42:41.825	+40:51:54.61	FK5 (J2000)	5	2
M33	01:33:50.904	+30:39:35.79	FK5 (J2000)	5	3
M49	12:29:46.798	+08:00:01.48	FK5 (J2000)	5	4
M51	13:29:52.698	+47:11:42.93	FK5 (J2000)	5	5
M58	12:37:43.597	+11:49:05.12	FK5 (J2000)	5	6
M59	12:42:02.322	+11:38:48.95	FK5 (J2000)	5	7
M60	12:43:40.008	+11:33:09.40	FK5 (J2000)	5	8
M61	12:21:54.950	+04:28:24.92	FK5 (J2000)	5	9
M63	13:15:49.329	+42:01:45.44	FK5 (J2000)	5	10
M64	12:56:43.696	+21:40:57.57	FK5 (J2000)	5	11
M65	11:18:55.957	+13:05:31.96	FK5 (J2000)	5	12
M66	11:20:15.026	+12:59:28.64	FK5 (J2000)	5	13
M74	01:36:41.772	+15:47:00.46	FK5 (J2000)	5	14

Below the table, there are controls for 'Remaining' (5), 'Priority' (1), and a 'Select' checkbox. At the bottom, there are buttons for 'Add', 'Duplicate', 'Remove', 'Remove all', 'Load', and 'Undo'.

# Survey container — in the OMP

Save Image Prioritize Validation

### Survey Information

Use this editor to enter the survey information.

Title:

Survey Targets Target Information

Name	X Axis	Y Axis	Coord System
M31	00:42:44.330	+41:16:07.50	FK5 (J2000)
M32	00:42:41.825	+40:51:54.61	FK5 (J2000)
M33	01:33:50.904	+30:39:35.79	FK5 (J2000)
M49	12:29:46.798	+08:00:01.48	FK5 (J2000)
M51	13:29:52.698	+47:11:42.93	FK5 (J2000)
M58	12:37:43.597	+11:49:05.12	FK5 (J2000)
M59	12:42:02.322	+11:38:48.95	FK5 (J2000)
M60	12:43:40.008	+11:33:09.40	FK5 (J2000)
M61	12:21:54.950	+04:28:24.92	FK5 (J2000)
M63	13:15:49.329	+42:01:45.44	FK5 (J2000)
M64	12:56:43.696	+21:40:57.57	FK5 (J2000)
M65	11:18:55.957	+13:05:31.96	FK5 (J2000)
M66	11:20:15.026	+12:59:28.64	FK5 (J2000)
M74	01:36:41.772	+15:47:00.46	FK5 (J2000)

Remaining  Priority

Add Duplicate Remove Remove

Becomes multiple MSBs in the OMP.

### MSBs remaining to be observed:

MSB	Target	Waveband	Instrument	Est. time	Remaining
1	M31	850	SCUBA-2	0.52 hours	5
2	M32	850	SCUBA-2	0.52 hours	5
3	M33	850	SCUBA-2	0.52 hours	5
4	M49	850	SCUBA-2	0.52 hours	5
5	M51	850	SCUBA-2	0.52 hours	5
6	M58	850	SCUBA-2	0.52 hours	5
7	M59	850	SCUBA-2	0.52 hours	5
8	M60	850	SCUBA-2	0.52 hours	5
9	M61	850	SCUBA-2	0.52 hours	5
10	M63	850	SCUBA-2	0.52 hours	5
11	M64	850	SCUBA-2	0.52 hours	5
12	M65	850	SCUBA-2	0.52 hours	5
13	M66	850	SCUBA-2	0.52 hours	5
14	M74	850	SCUBA-2	0.52 hours	5
15	M77	850	SCUBA-2	0.52 hours	5
16	M81	850	SCUBA-2	0.52 hours	5
17	M82	850	SCUBA-2	0.52 hours	5
18	M84	850	SCUBA-2	0.52 hours	5
19	M85	850	SCUBA-2	0.52 hours	5
20	M86	850	SCUBA-2	0.52 hours	5

Click [here](#) for more details on the science program.  
Click [here](#) to download or plot the regions observed in this program.



# Survey container — fetched MSB

The screenshot displays a software interface with two main windows. The background window shows a tree view of a survey container with items like 'SCUBA-2', 'Site Quality', 'Note: Please read', 'Science Observation', 'Sequence', and 'Scan'. A green oval highlights the 'Note: Please read' item. The foreground window is titled 'Target Information' and contains the following fields and controls:

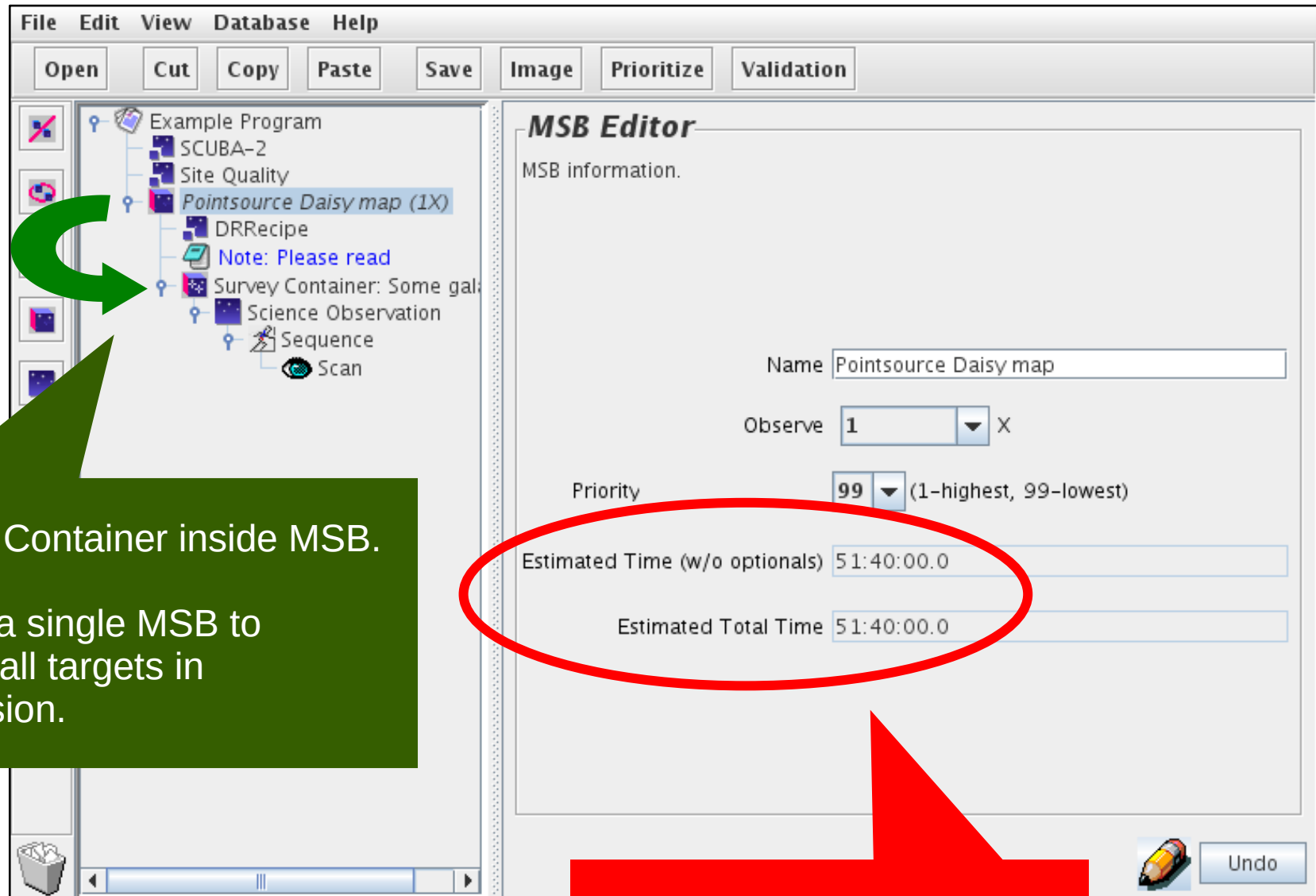
- Menu: File, Edit, View, Database, Help
- Buttons: Open, Cut, Copy, Paste, Save, Image, Prioritize, Validation
- Text: Use this editor to enter the target information.
- Form fields: Name (M31), Tag (SCIENCE), TargetType (RA/Dec)
- Buttons: RA/Dec, Orbital Elements, Named Planets, TLE
- Section: Object
- Form fields: SIMBAD Names ESO, Resolve Name, Resolved Name
- Form fields: System (FK5 (J2000)), Ra (00:42:44.330), Dec (+41:16:07.50)
- Section: Radial Vel/Tracking, Proper Motion, Chop Settings
- Form fields: Velocity (km/s or redshift) (radio, 0.0), Frame (LSRK)
- Table:

Tag	Name	X Axis	Y Axis	System
SCIENCE	M31	00:42:44.330	+41:16:07.50	FK5 (J2000)

Buttons at the bottom: Plot..., Set SCIENC..., Remove, Add, REFER..., Undo

**MSB fetched from the OMP**  
System inserts a target from the survey container when MSB is observed.

# Survey container in MSB



Survey Container inside MSB.

**Means:** a single MSB to observe all targets in one session.

Very long time estimate!

# Survey container in MSB — OMP

The screenshot shows the MSB Editor interface. On the left, a tree view displays the program structure: Example Program, SCUBA-2, Site Quality, Pointsource Daisy map (1X), DRRecipe, Note: Please read, Survey Container: Some gal..., Science Observation, Sequence, and Scan. The main window displays MSB information. A table titled 'MSBs remaining to be observed:' is shown, with a red circle around the 'Est. time' and 'Remaining' columns. A red arrow points from the table to a red text box at the bottom.

MSB	Target	Waveband	Instrument	Est. time	Remaining
1	M31/M32/M33/M49 /M51/M58/M59/M60 /M61/M63/M64/M65 /M66/M74/M77/M81 /M82/M84/M85/M86	850	SCUBA2	51.67 hours	1

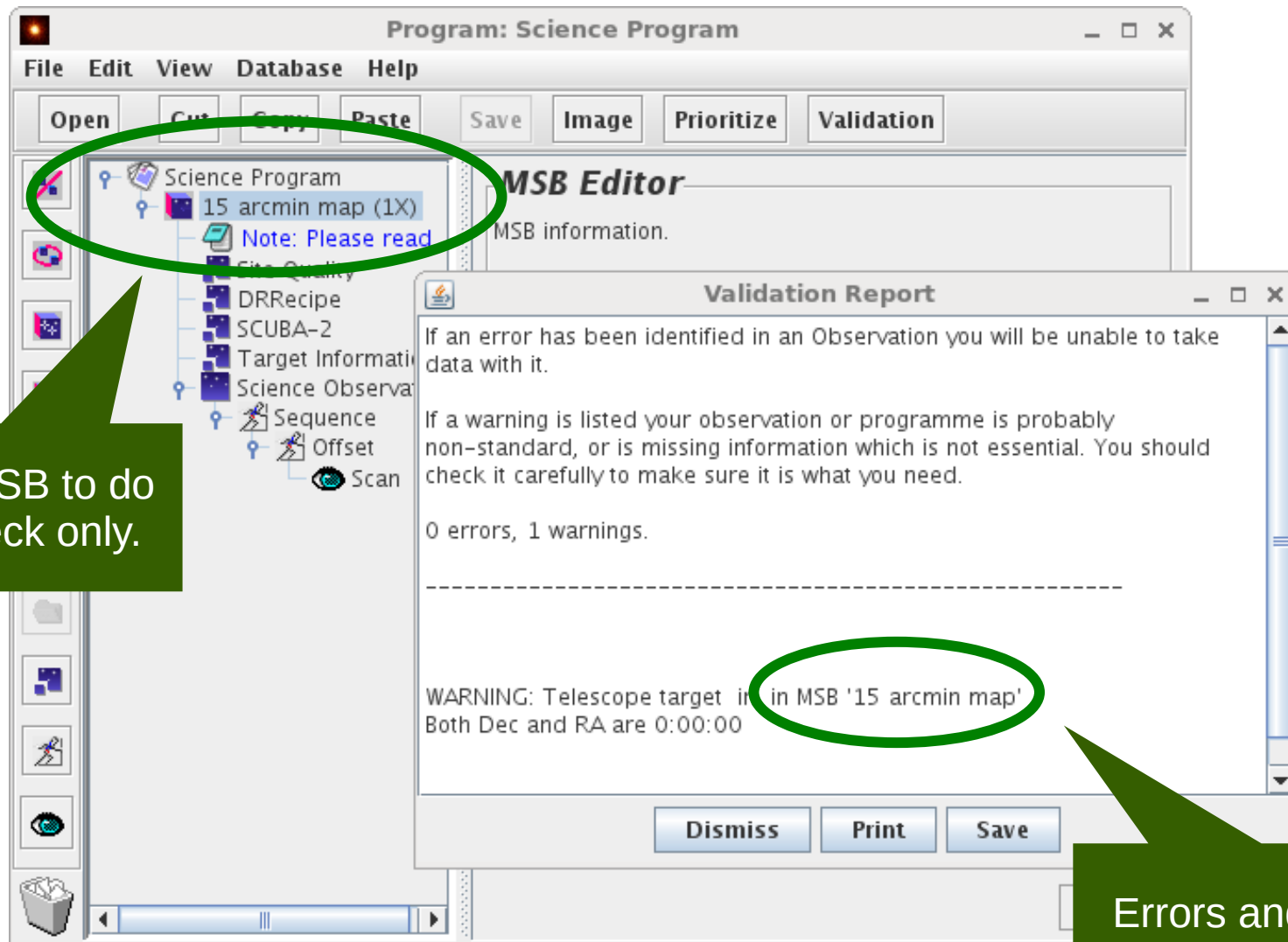
Click [here](#) for more details on the science program.  
Click [here](#) to download or plot the regions observed in this program.

Single large MSB in the OMP.  
Normally not what you want!

# Validation — overview

- Validation of a single MSB:
  - Internal check only.
- Validation of whole program:
  - Internal check of each MSB.
  - XML schema validation of program.

# Validation — internal check



Select an MSB to do internal check only.

Errors and warnings generated by the OT.

# Validation — XML schema validation

Program: Science

File Edit View Database Help

Open Cut Copy Paste Save

Science Program

15 arcmin map (1X)

Note: Please read

Site Quality

DRRecipe

**Program**

General program information taken from the proposal.

Title

PI

Country

Project ID

w/o optionals) 00:40:50.4

total Time 00:40:50.4

**Validation Report**

ERROR: Schema validation error

Validation error in MSB<15 arcmin map>  
XML line number : 8 column 15

```
<meta_gui_filename>validation_example.xml</meta_gui_filename>
--> <ot_version>20170106</ot_version> <--
<telescope>jcmt</telescope>
```

Obs: <Science observation>  
comp

k-type.2.4.a: Invalid content starting with element  
ii.edu/schema/TOML":meta\_gui\_hasBeenSaved,  
ii.edu/schema/TOML":meta\_gui\_selected,  
ii.edu/schema/TOML":meta\_gui\_selectedOffsetPos,  
ii.edu/schema/TOML":meta\_gui\_selectedTelescopePos,  
"http://omp.eao.hawaii.edu/schema/TOML":meta\_gui\_selectedTelObsComp,  
"http://omp.eao.hawaii.edu/schema/TOML":meta\_unique,  
"http://omp.eao.hawaii.edu/schema/TOML":meta\_version,  
"http://omp.eao.hawaii.edu/schema/TOML":country}' is expected.>

Dismiss Print Save

Select program to do internal check and schema validation.

Technical description of problems in XML file.

Cause of error: "country" field is empty.

# Common pitfalls (1/2)

- Some MSBs can be hard to observe:
  - Long time.
  - Strict constraints (e.g. opacity, scheduling).
  - Widely-spaced targets.
- **“Observe” counter vs. “Repeat” iterator.**
  - MSB “observe” counter: do MSB multiple times.
  - “Repeat” iterator: extends duration of the MSB.

# Common pitfalls (2/2)

- **Must use Oracle's version of Java.**
  - OpenJDK can appear to work at first but problems often occur.
- **Sometimes updates only saved on key-press.**
  - Information pasted into the OT (e.g. notes) may not be saved.



# Links

- OT Resources:

- Download:

- <https://www.eaobservatory.org/jcmt/observing/software-installation/#observing-tool>

- Documentation:

- <https://www.eaobservatory.org/JCMT/observing-tool>

## Tutorials.

- Basics:

- [http://www.eaobservatory.org/JCMT/observing-tool-tutorials/jcmt\\_ot\\_basics.html](http://www.eaobservatory.org/JCMT/observing-tool-tutorials/jcmt_ot_basics.html)
    - [http://www.eaobservatory.org/JCMT/observing-tool-tutorials/ot\\_basics\\_tutorial\\_files.tar.gz](http://www.eaobservatory.org/JCMT/observing-tool-tutorials/ot_basics_tutorial_files.tar.gz)

- Tricks:

- [http://www.eaobservatory.org/JCMT/observing-tool-tutorials/jcmt\\_ot\\_tricks.html](http://www.eaobservatory.org/JCMT/observing-tool-tutorials/jcmt_ot_tricks.html)
    - [http://www.eaobservatory.org/JCMT/observing-tool-tutorials/ot\\_tricks\\_tutorial\\_files.tar.gz](http://www.eaobservatory.org/JCMT/observing-tool-tutorials/ot_tricks_tutorial_files.tar.gz)