



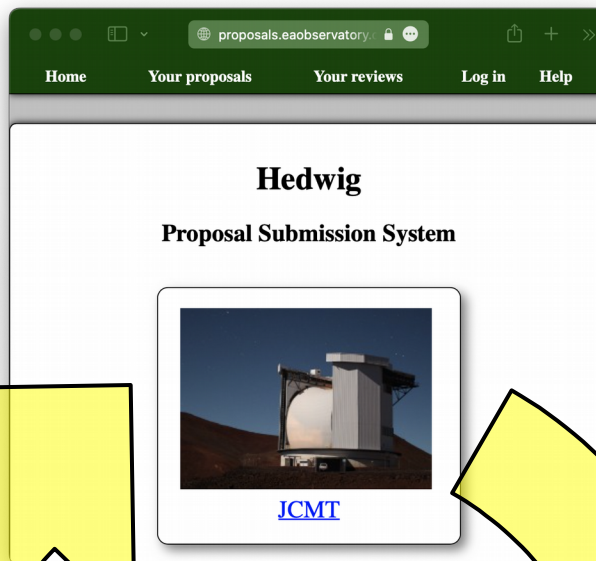
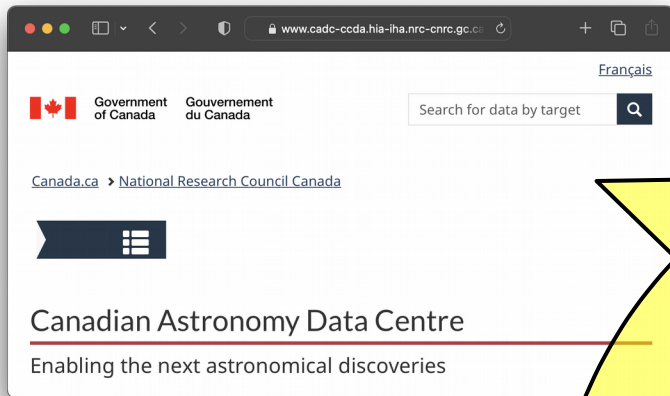
JCMT Project Lifecycle and the Observing Tool

Overview

- JCMT project lifecycle.
 - Proposals, observing and accessing data.
- The observing tool.
 - Libraries.
 - Position editor.
 - Frequency editor.
 - Observing modes.
- Interactive tutorial.

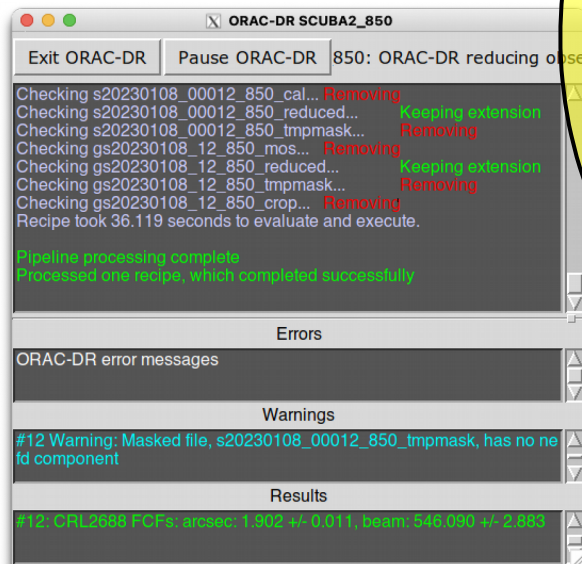
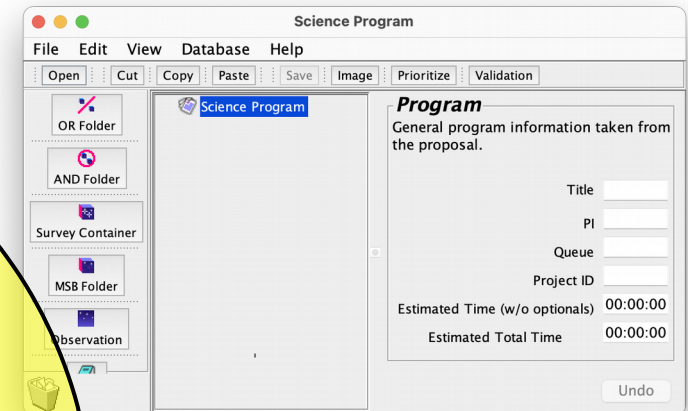
project lifecycle

CADC

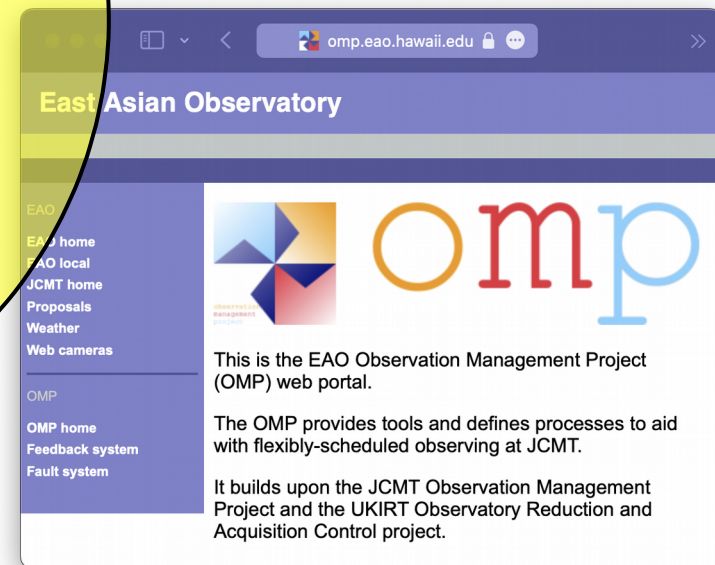
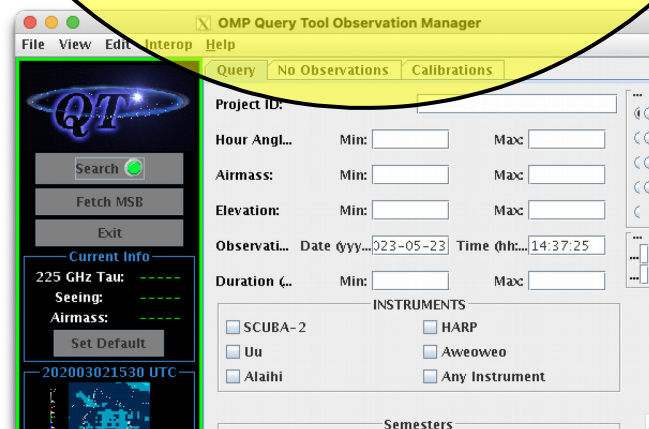


Hedwig

OT



ORAC-DR



OMP

QT

Proposal submission

- Proposals submitted via Hedwig.
 - 2 calls per year:
 - ‘**A**’ semester: *February – July*, call ~ September
 - ‘**B**’ semester: *August – January*, call ~ March
 - Urgent proposals at any time.
- Approval by Time Allocation Committee.
 - Process includes:
 - Technical assessment by JCMT staff.
 - External reviews.
 - OMP projects created for approved proposals.

MSB preparation

- Observer prepares MSBs:
 - Uses the Observing Tool.
 - Uploads MSBs to the OMP.
- Observatory assigns a “*Friend of Project*”.
 - Checks MSBs before activation.
 - Assists with data quality assessment and reduction.

MSB: “*Minimum schedulable block*”

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

Observing

- Telescope operator selects MSBs using the Query Tool, based on:
 - Weather conditions.
 - Source availability.
 - Instrument availability.
 - TAC-assigned priority.
- Project members notified via “flex”.
- Observing logs available in the OMP.
 - Can include a quality flag and comments.

Data uploaded to CADC

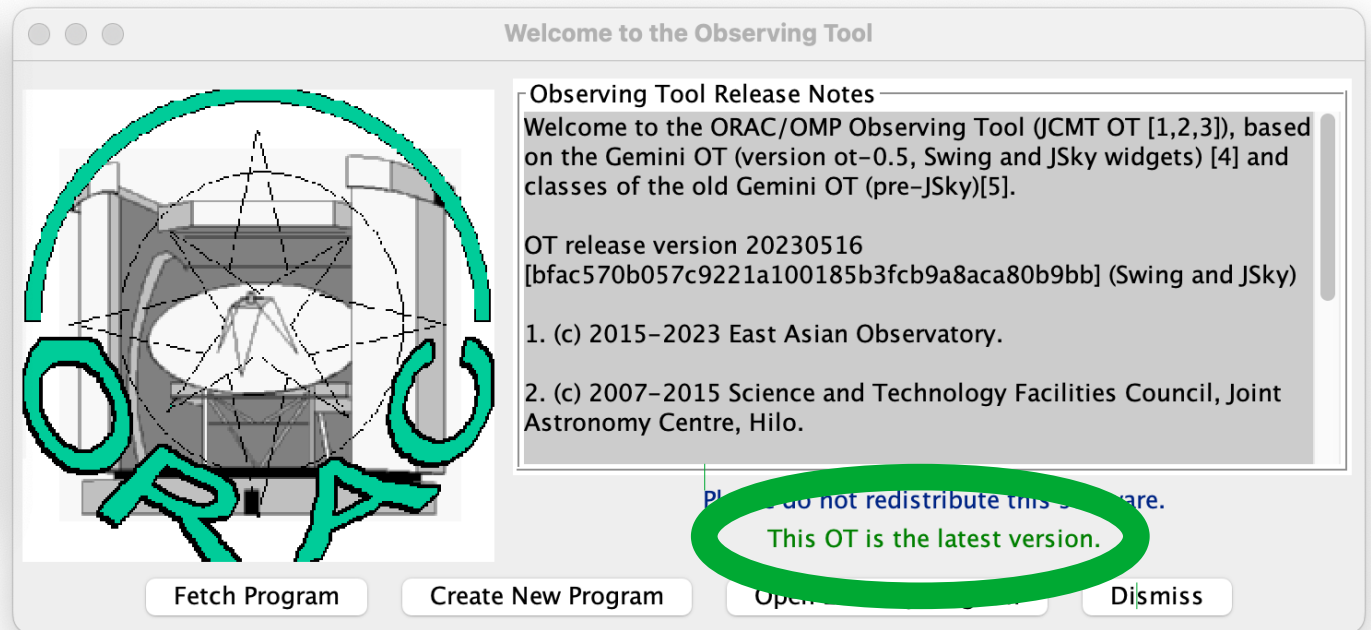
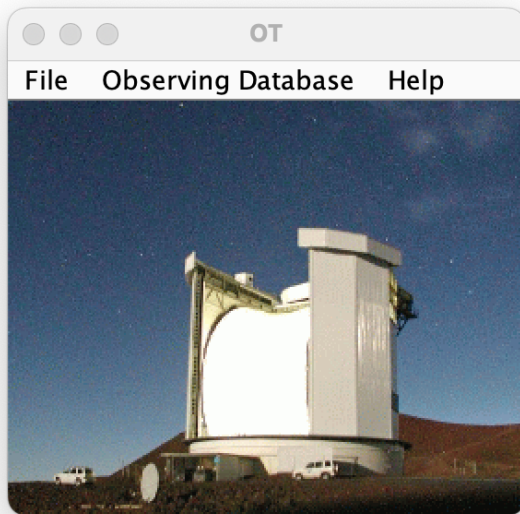
- Raw data uploaded continuously.
 - May be available from 4 hours after end of observation.
 - Cal. level 0: *“Raw instrumental”*
- Pipeline processing at EAO.
 - Processing starts the afternoon following observation.
 - Reduced data available as soon as ready.
 - Cal. level 2: *“Calibrated”*
- Data become public.
 - 1 year after end of semester in which observed.

the observing tool

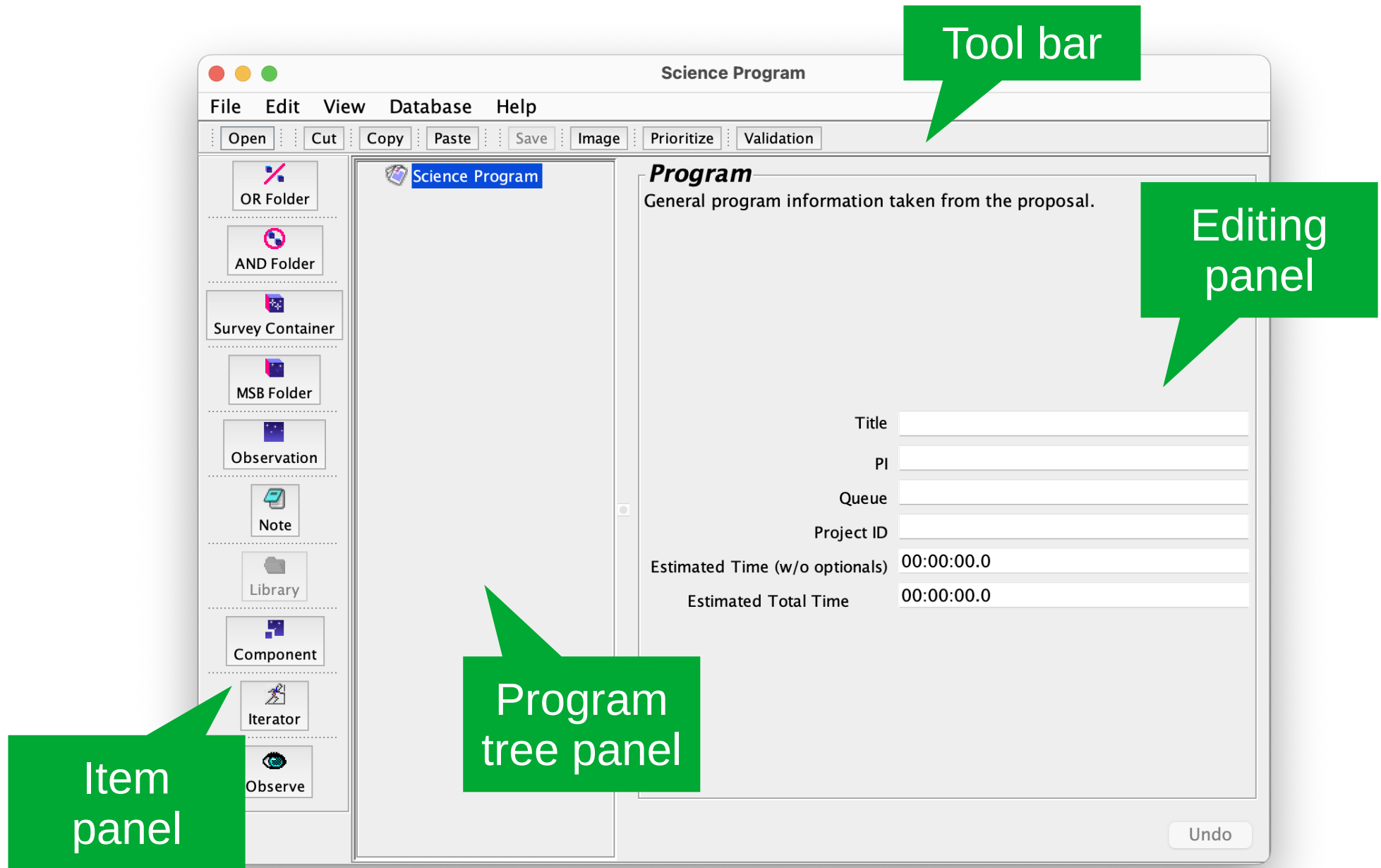
Starting the OT

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

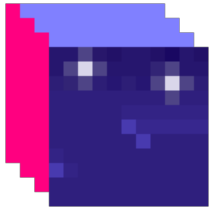
```
% java -jar jcmtot.jar
```



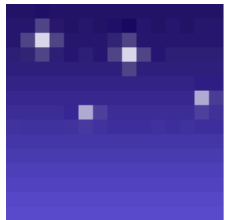
The program window



Program items



MSB

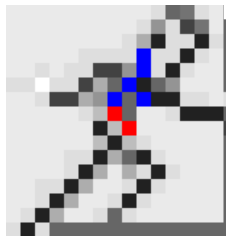


Observation



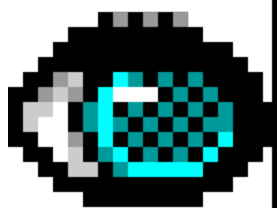
Component

- configuration



Iterator

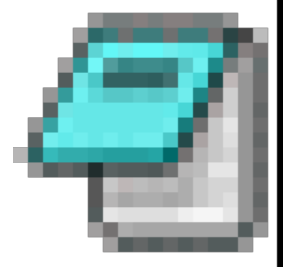
- modifies observation as part of sequence



“Eye”

- triggers taking data

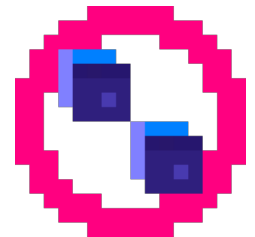
Note



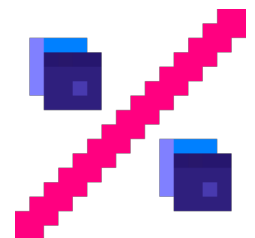
Survey container



And folder

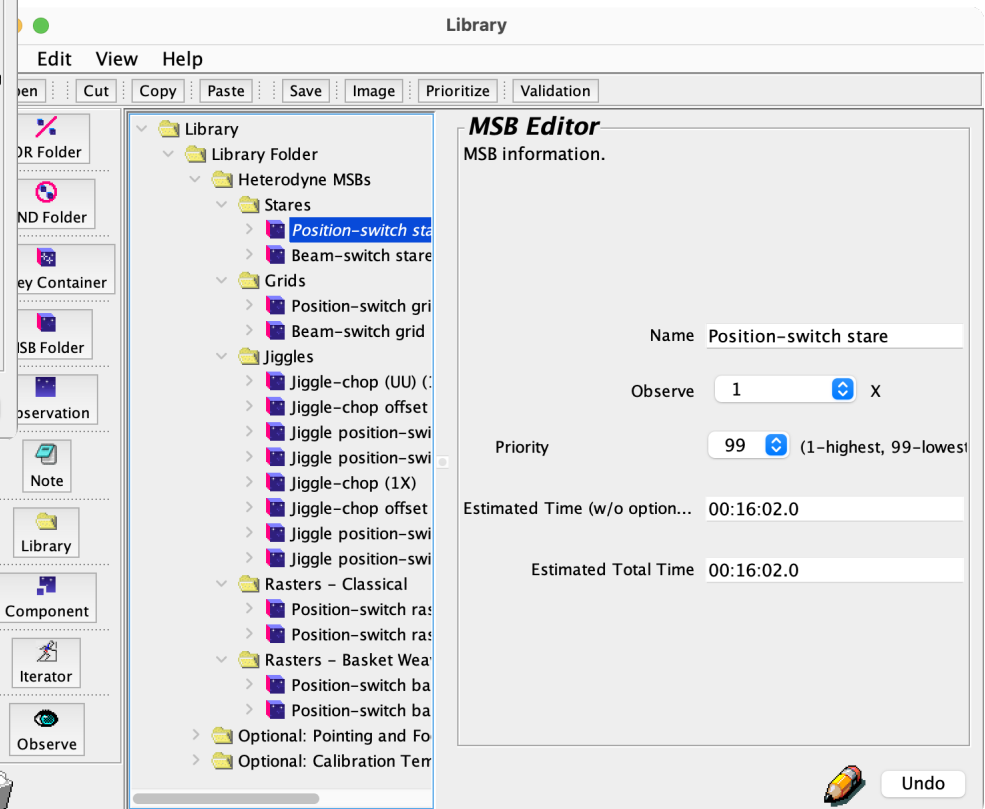
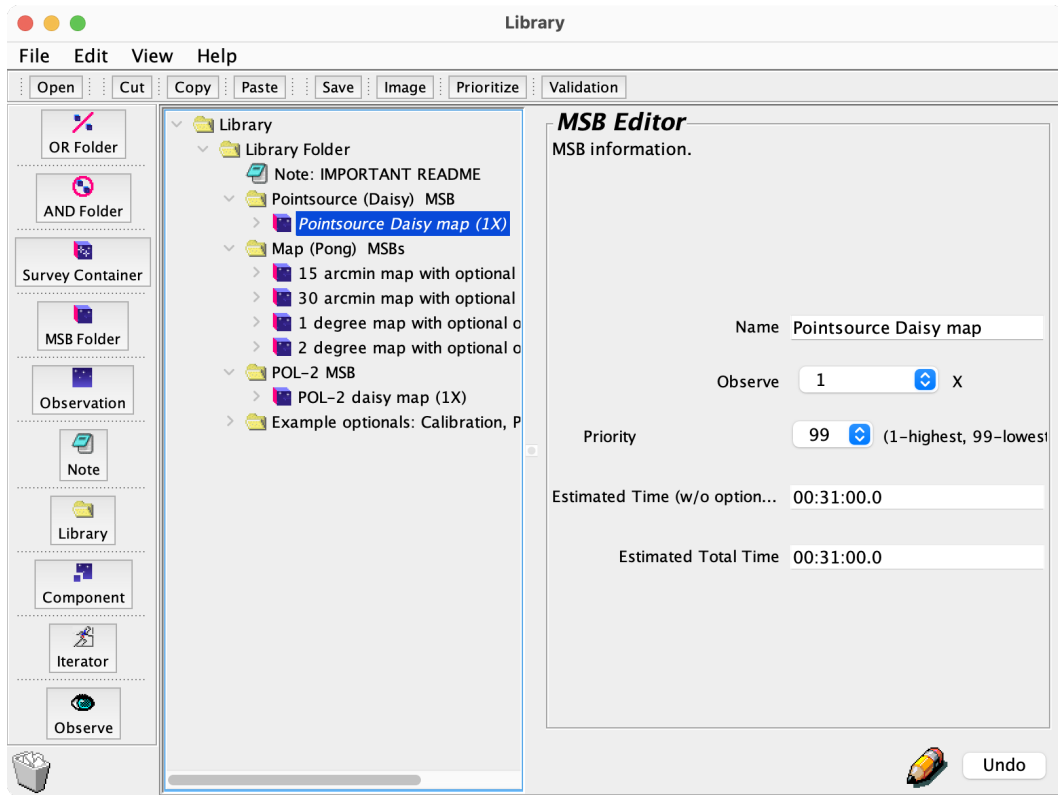


Or folder



MSB libraries

SCUBA-2



AC SIS

An example MSB

The screenshot shows the 'Science Program' interface. On the left is a sidebar with icons for 'OR Folder', 'AND Folder', 'Survey Container', 'MSB Folder', 'Observation', 'Note', 'Library', 'Component', 'Iterator', and 'Observe'. The main panel displays a tree view of the 'Example Program' containing an 'Example MSB (1X)' with sub-items like 'Note: Please read', 'Site Quality', 'Het Setup (HARP)', 'DRRecipe', 'Note: Calibration', and 'Target Information: OMC 2-3'. The 'Target Information' editor is open on the right, showing fields for Name, TargetType, Object, System, Ra, Dec, Velocity, and Frame. A table at the bottom lists the target data.

Target name entered

Coordinates entered

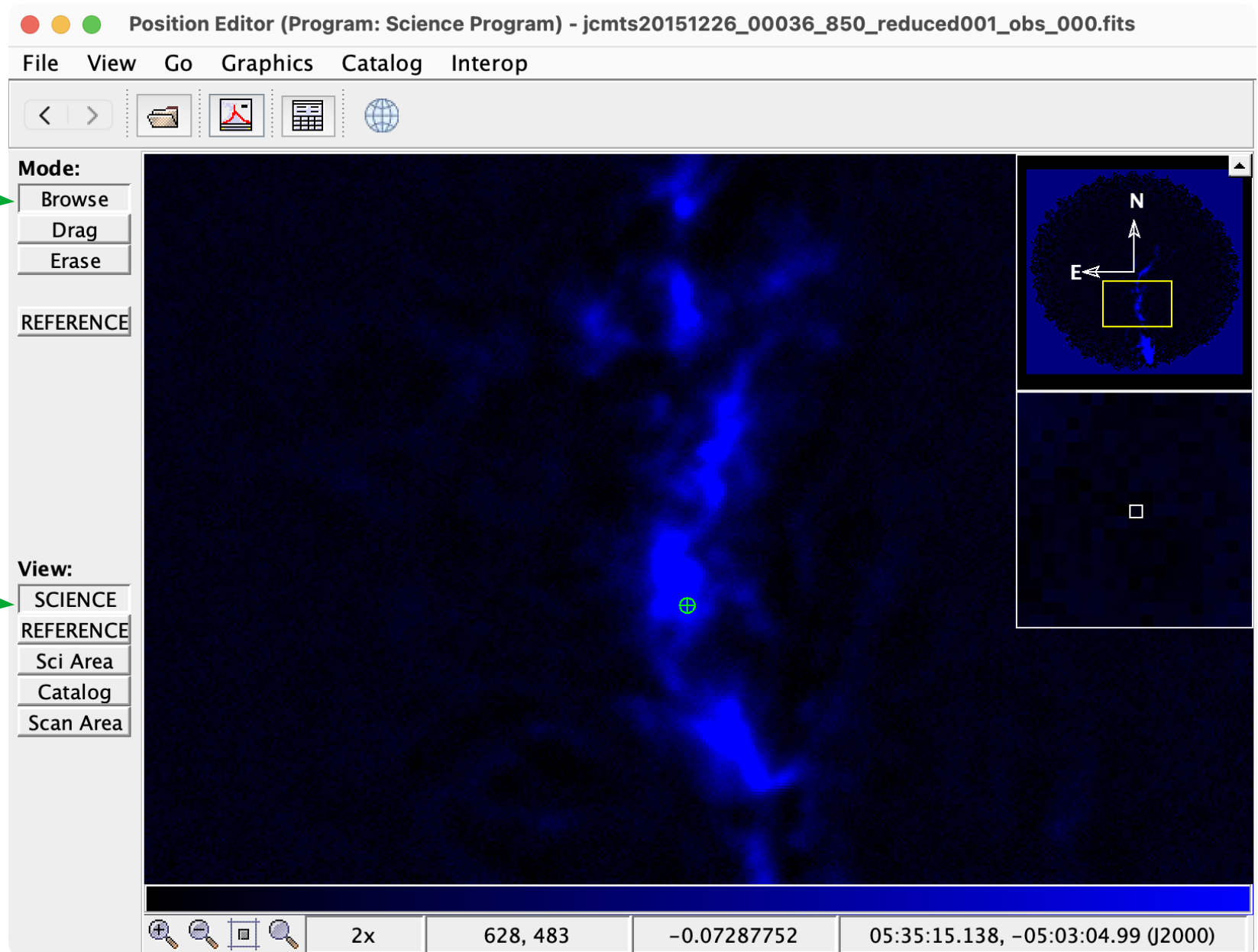
Jiggle-chop MSB copied from library

| Tag | Name | X Axis | Y Axis | System |
|---------|---------|----------|-----------|-------------|
| SCIENCE | OMC 2-3 | 05:35:26 | -05:10:20 | FK5 (J2000) |

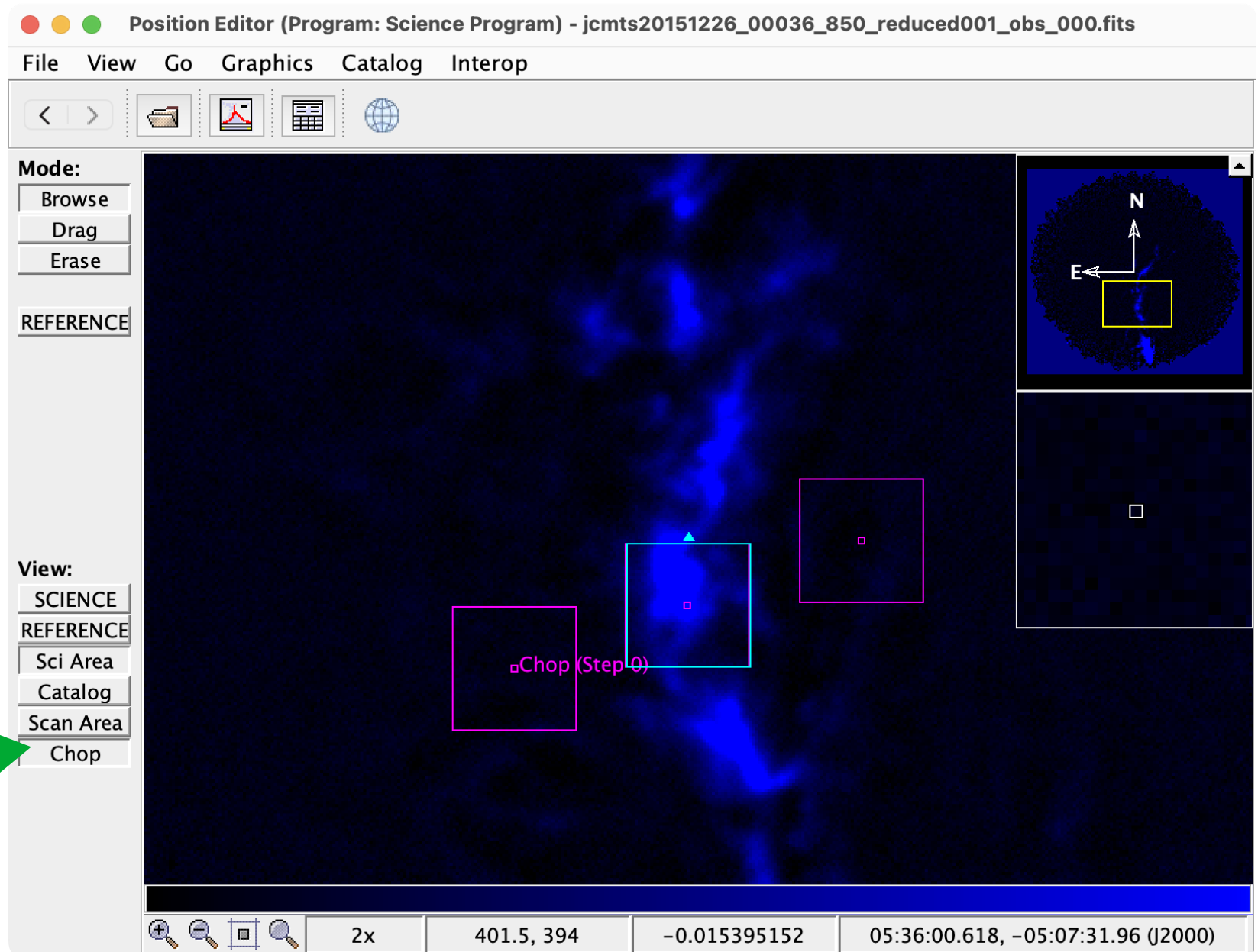
The position editor

Mode
buttons

Feature
buttons



The position editor — chop



Heterodyne setup

Program: Science Program

File Edit View Database Help

Open Cut Copy Paste Save Image Prioritize Validation

OR Folder

AND Folder

Survey Container

MSB Folder

Observation

Note

Library

Component

Iterator

Observation

Example Program

Example MSB (1X)

Note: Please read

Site Quality

Het Setup (HARP)

DRRecipe

Note: Calibration

Target Information: OMC 2-3

Science Observation

Sequence

Repeat (1X)

Chop

Jiggle

JCMT Heterodyne

The Heterodyne instrument is configured with this component.

Front End Configuration

Front ... ☐ Uu ☐ Aweoweo ☐ A3m ☐ A3

☐ WB ☐ WD ☒ HARP

Sp. Re... ☐ 1 ☒ 2 ☐ 3 ☐ 4 Special C... None

Mode: ☒ ssb ☐ dsb ☐ 2sb ☐ usb ☐ lsb

Sideb... ☒ best ☐ usb ☐ lsb

Front End Summ... Low limit... 325 High limit... 375

Bandwidths 1000.0 (1) 250.0 (1)

Frequency Setup

☒ Default tuning velocity to target radial velocity

Velocity -200 Definition optical Frame HELIOCENTRIC

CO 3 - 2 345.795989 GHz Accept

Sky freq. 346.026834 GHz Show Frequency Editor Hide Frequency Editor

Frequency Configuration

| Region | Species | Trans. | Rest. Freq. | Centre Freq. | BW | res | overlap | channels |
|--------|---------|-------------|--------------|--------------|-------|-----|---------|----------|
| 0 | CO | 3 - 2 | 345.79598... | 5.3E9 | 1.0E9 | 977 | 0.0 | 1024 |
| 1 | SiS | 19 0 - 18 0 | 344.779481 | 4.2828125... | 2.5E8 | 61 | 0.0 | 4096 |

Undo

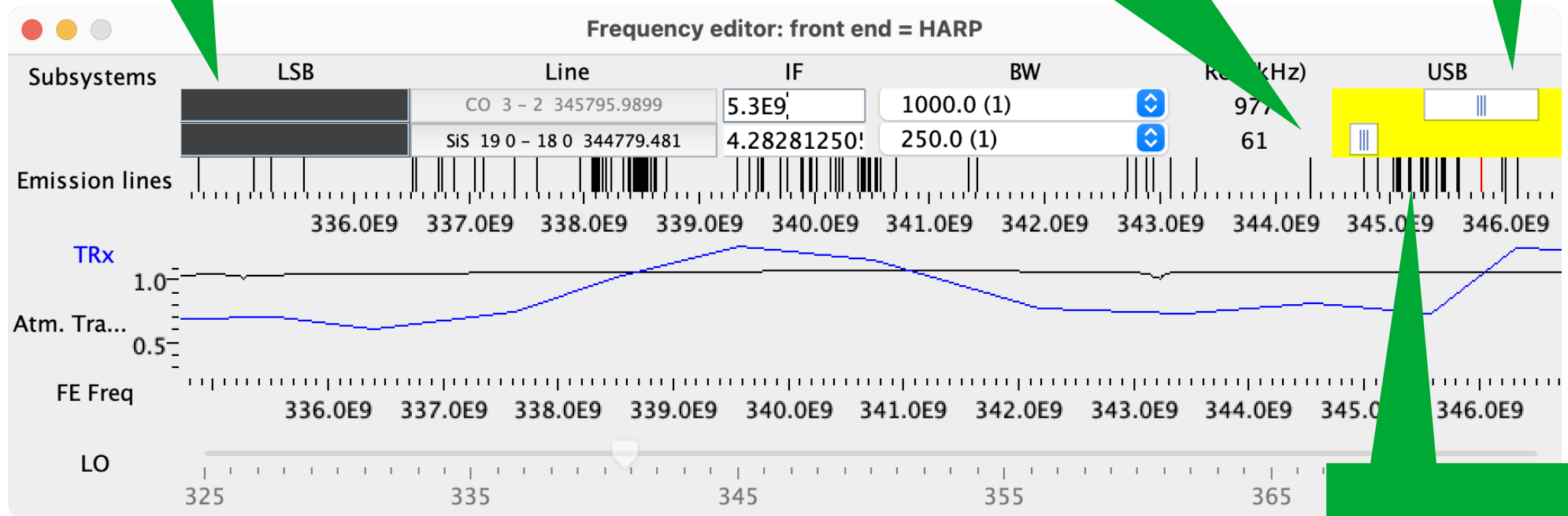
Primary
subsystem
shown here
as "Region 0"

The frequency editor

Lower
sideband

Sliders are
spectral regions

Upper
sideband

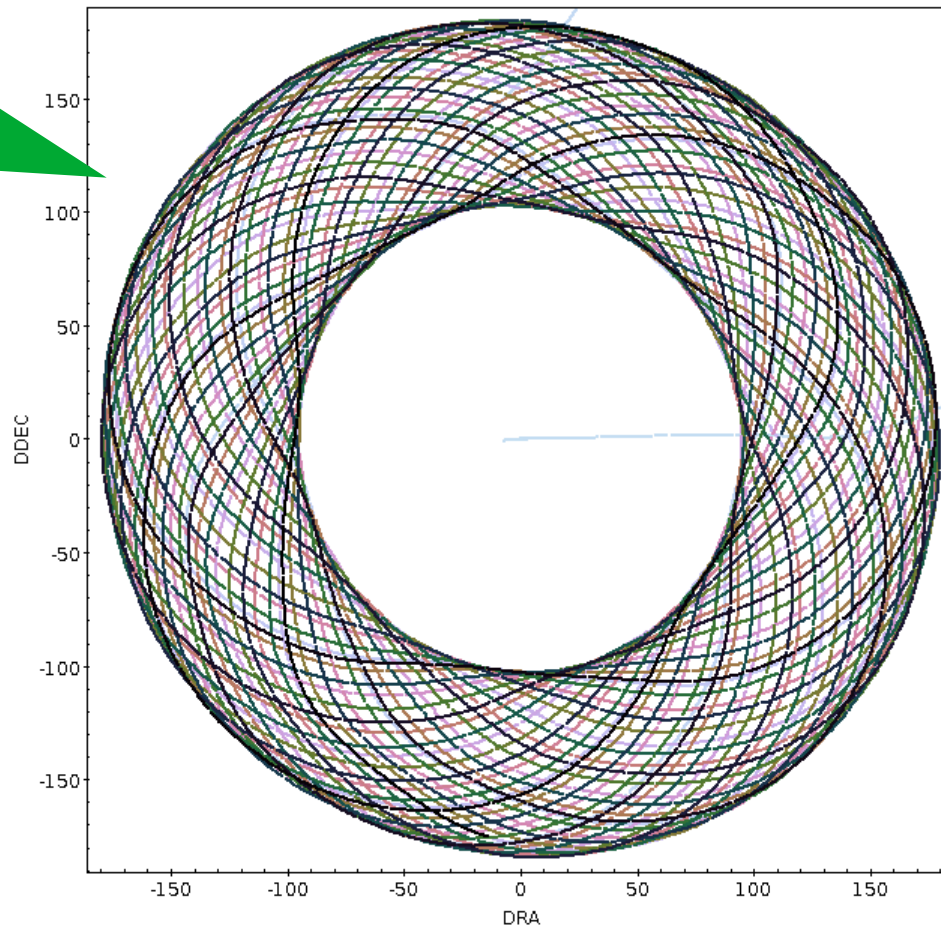


Line
catalog
entries

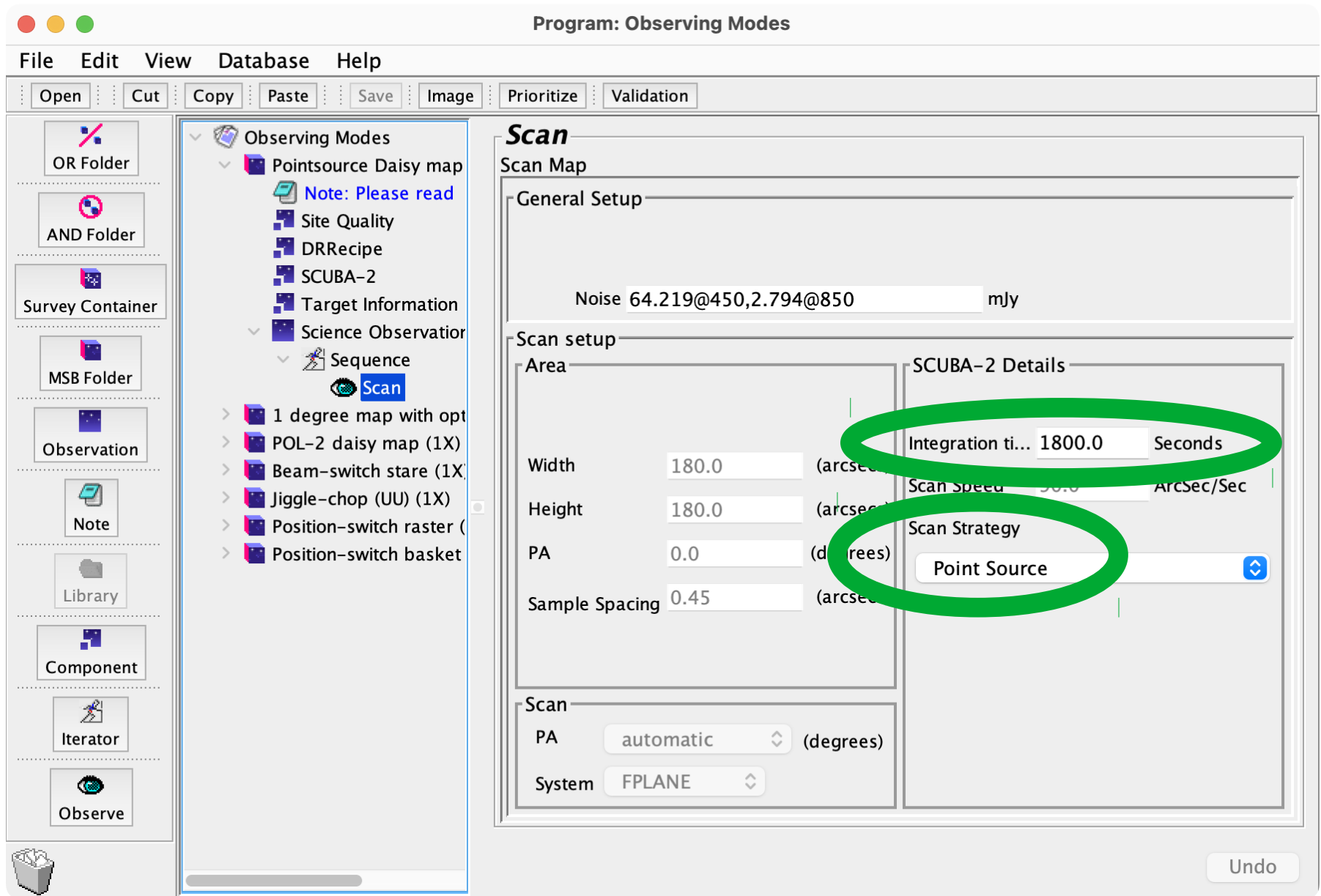
observing modes

SCUBA-2 daisy

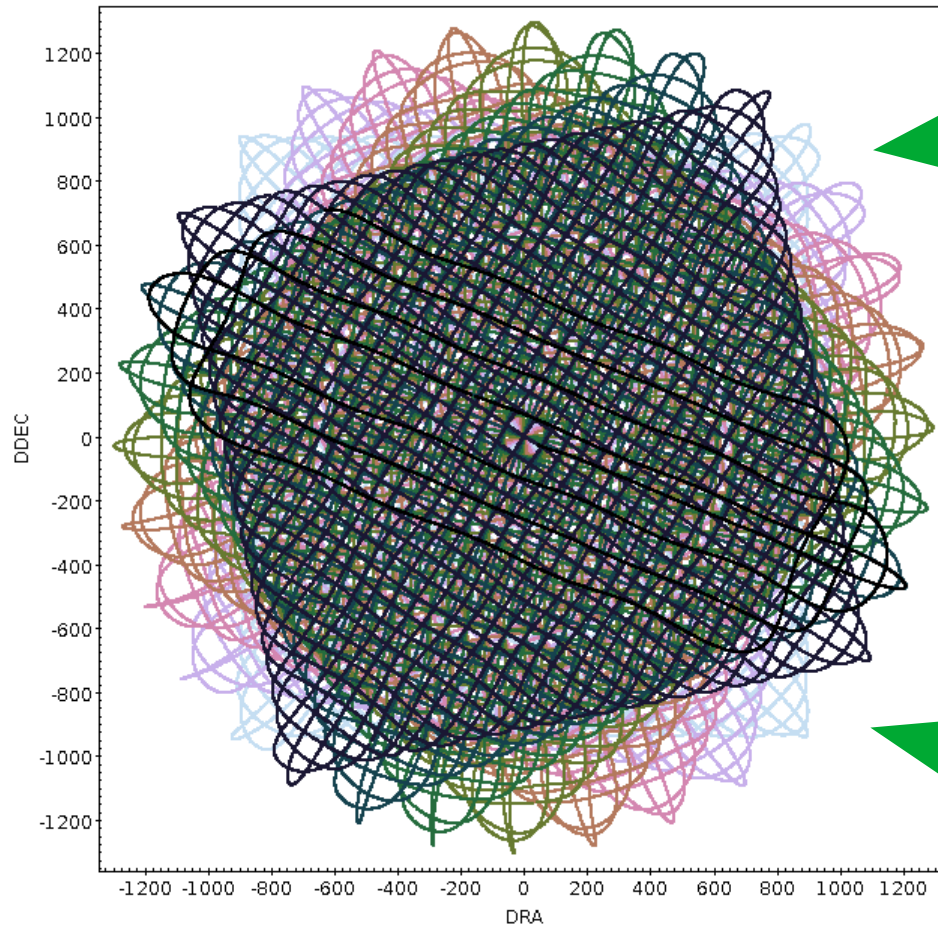
Fixed size
giving $\sim 3'$
coverage



SCUBA-2 daisy MSB



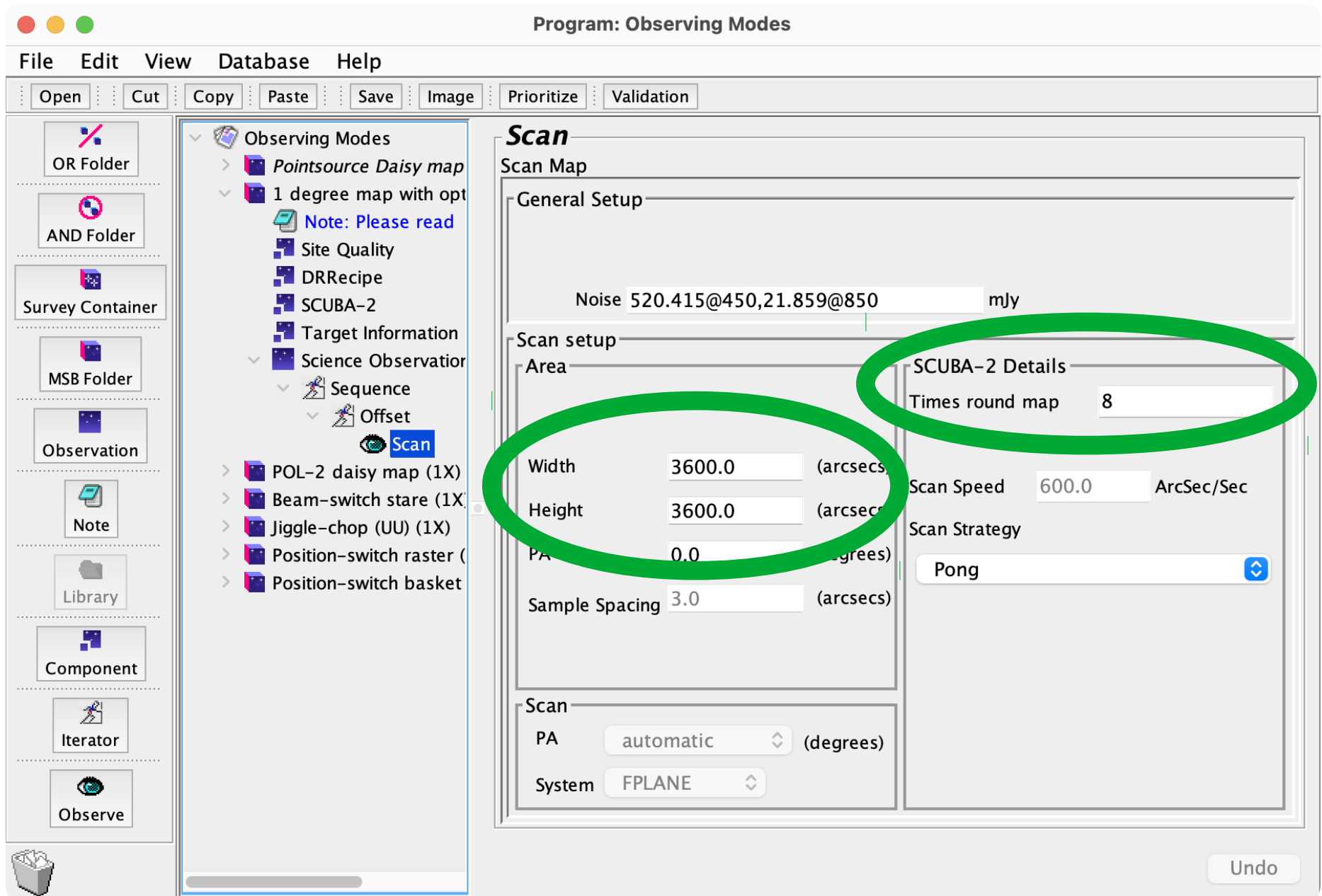
SCUBA-2 pong



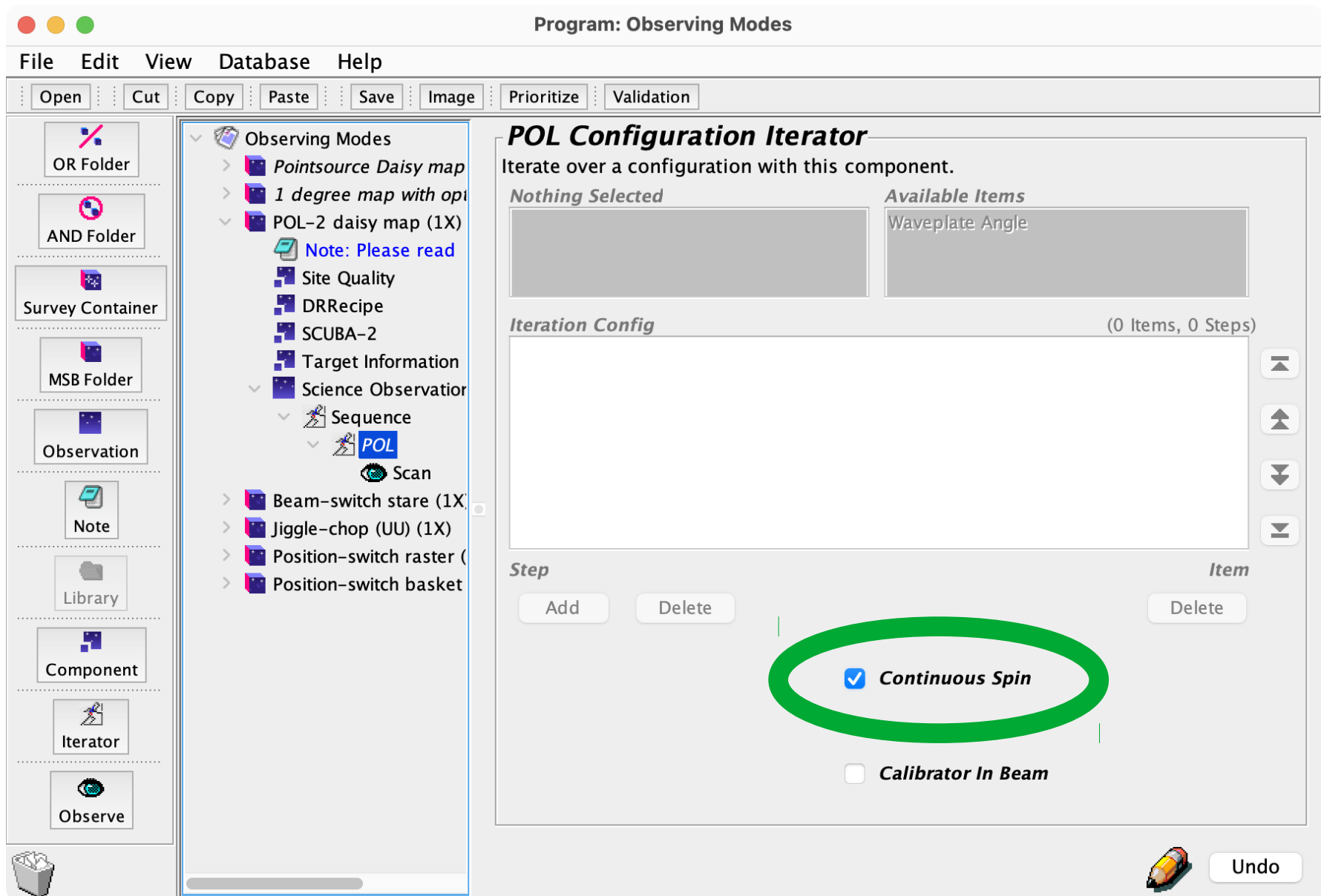
Pong pattern
repeated at a
number of
angles

Sizes available:
15', 30', (45'),
1°, 2°

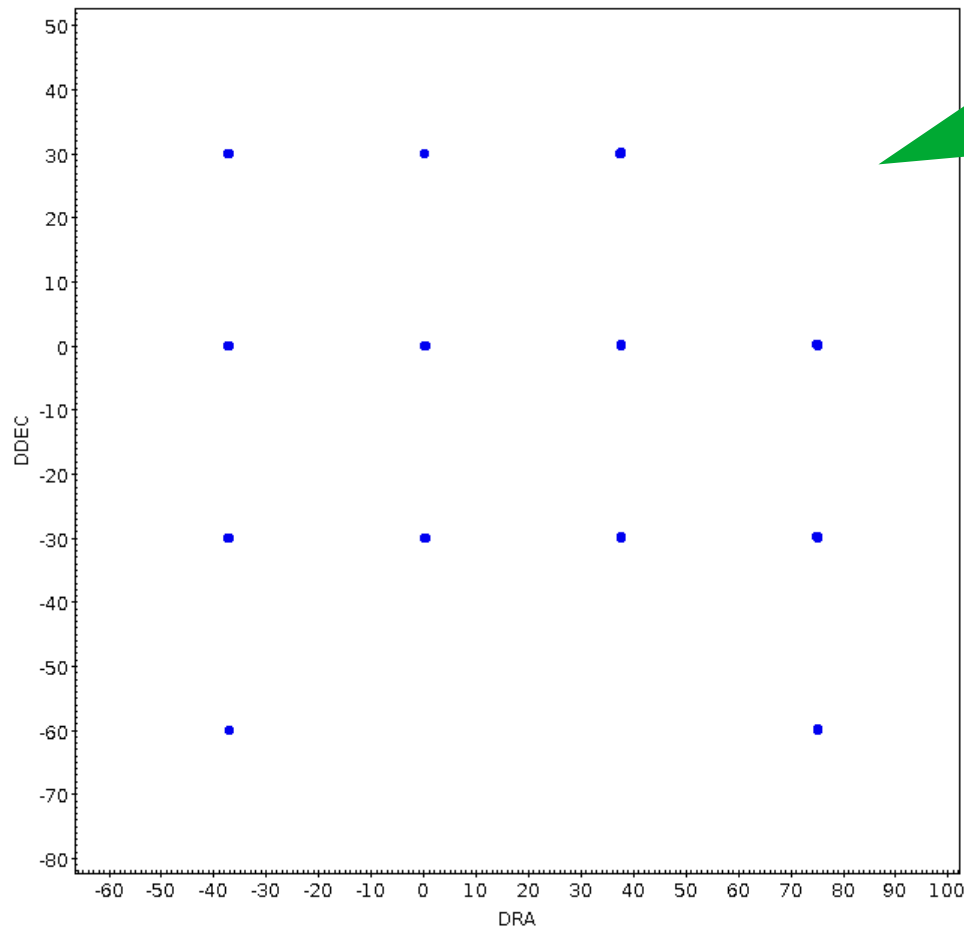
SCUBA-2 pong MSB



SCUBA-2 + POL-2



HARP stare



Under-sampled
with 14" beam

HARP stare MSB

Program: Observing Modes

File Edit View Database Help

Open Cut Copy Paste Save Image Prioritize Validation

OR Folder

AND Folder

Survey Container

MSB Folder

Observation

Note

Library

Component

Observing Modes

- Pointsource Daisy map (1X)
- 1 degree map with optional chop
- POL-2 daisy map (1X)
- Beam-switch stare (1X)
 - Note: Please read
 - Site Quality
 - Het Setup (HARP)
 - DRRecipe
 - Note: Calibration
 - Target Information
 - Science Observation
 - Sequence
 - Repeat (1X)
 - Chop
 - Stare

- Jiggle chop (UU) (1X)
- Position-switch raster (1X)
- Position-switch basket weave

Stare

Stare Observation Mode

Switching Mode

Beam

Array Centred ☐

Noise 0.157 K

Rotator Angles

If your program requires specific orientations of the array, select acceptable rotator angles. Otherwise please leave all angles unchecked for an automatic selection.

☐ 0.0 ☐ 90.0 ☐ 180.0 ☐ 270.0

Stare Setup

Secs per offset sample 360

Continuum Mode ☐

Map

PA 0.0 (degrees)

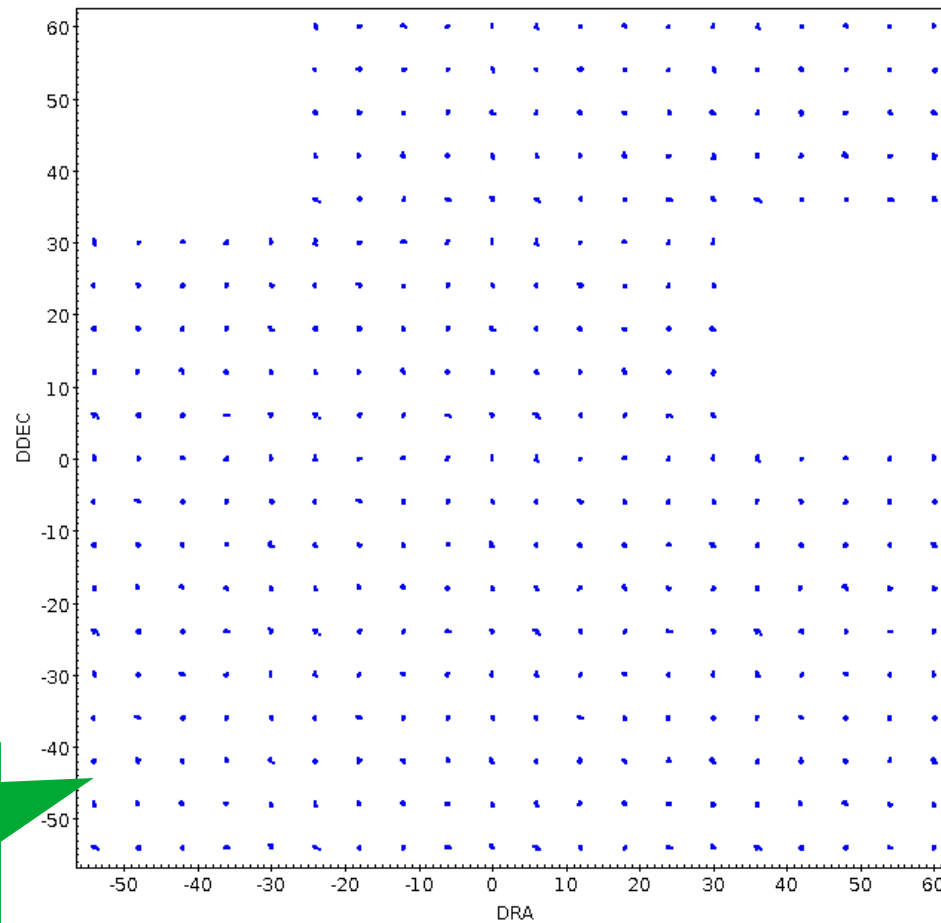
System TRACKING

Warning: Using continuum mode will significantly increase the duration of the observation. Continuum mode should only be used if an accurate measure of the continuum emission from the source is a requirement.

Undo

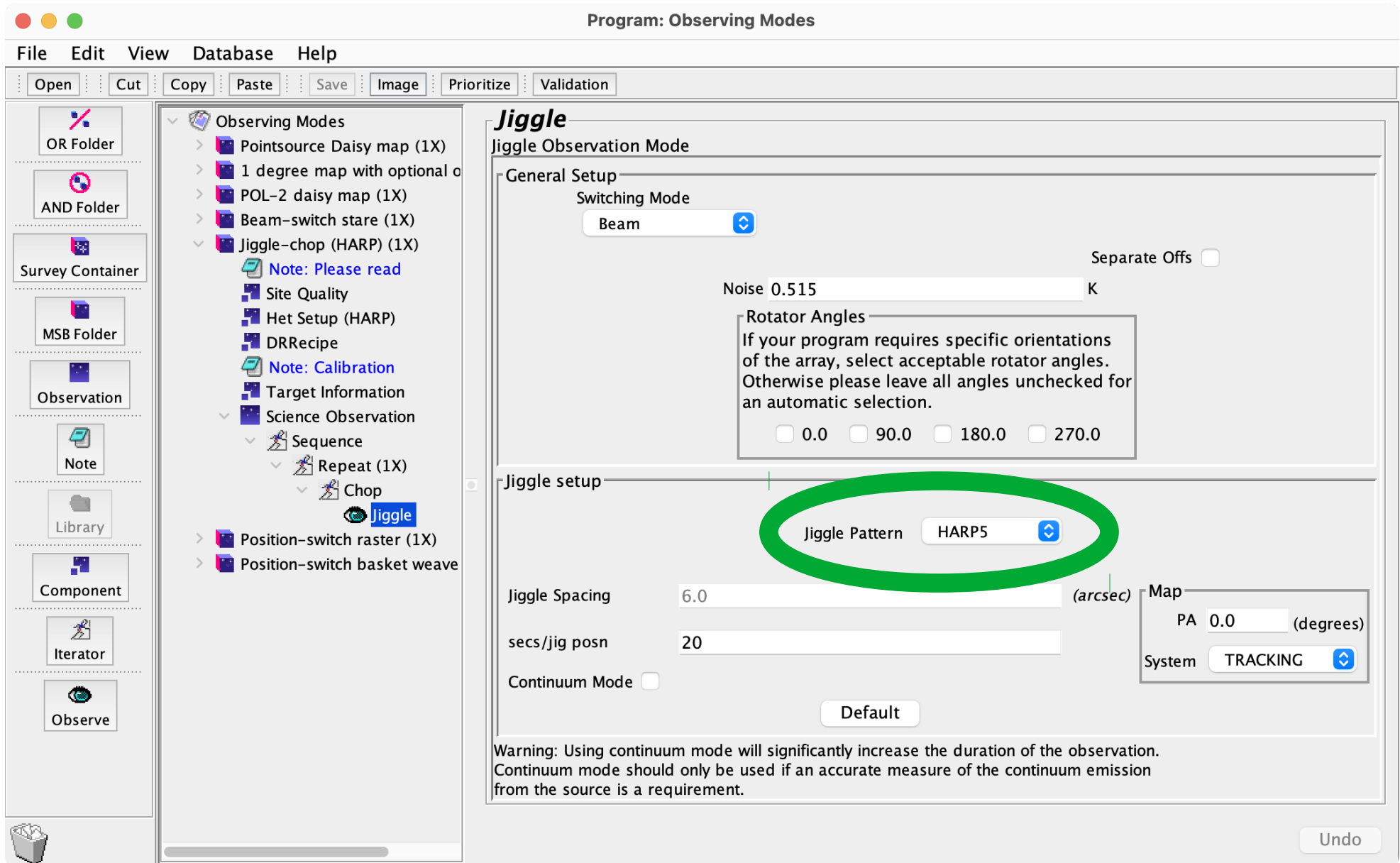
Beam switching requires a chop iterator

HARP-5 jiggle

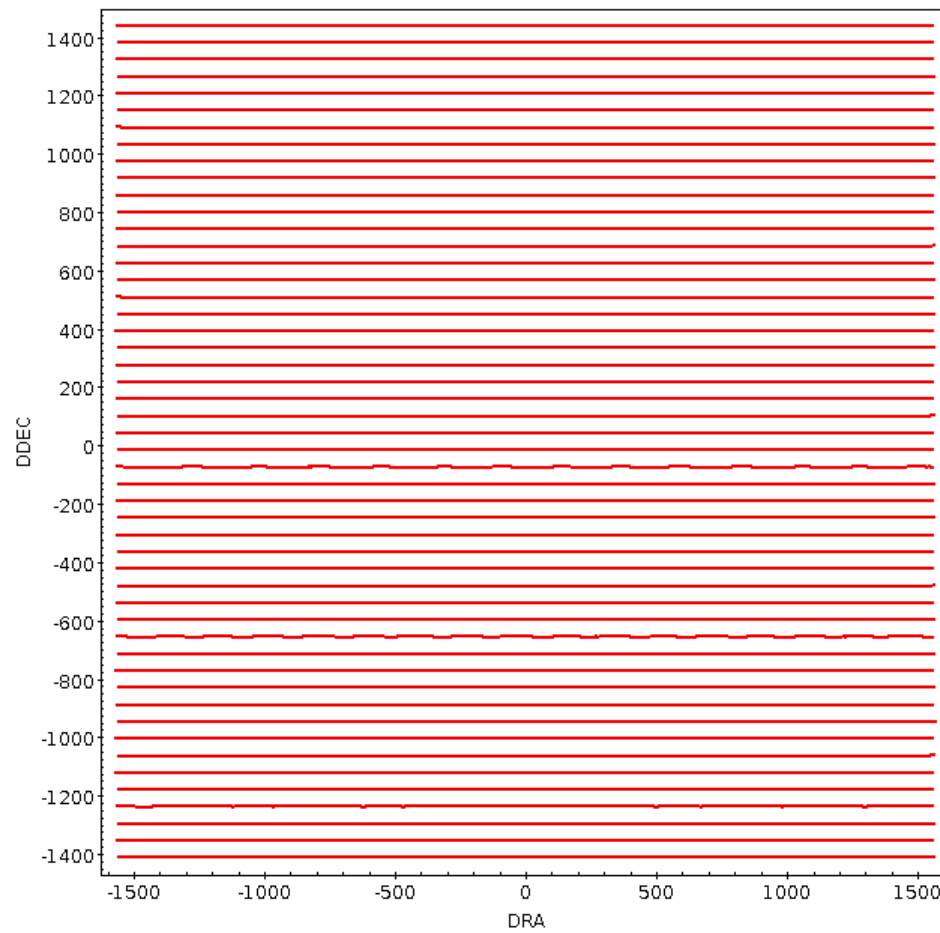


Beam moved to
fill in pattern

HARP-5 jiggle MSB



Raster



Raster MSB

Program: Observing Modes

File Edit View Database Help

Open Cut Copy Paste Save Image Prioritize Validation

OR Folder

AND Folder

Survey Container

MSB Folder

Observation

Note

Library

Component

Observing Modes

- Pointsource Daisy map (1X)
- 1 degree map with optional o
- POL-2 daisy map (1X)
- Beam-switch stare (1X)
- Jiggle-chop (HARP) (1X)
- Position-switch raster (1X)
- Note: Please read
- Site Quality
- Het Setup (HARP)
- DRRecipe
- Note: Calibration
- Target Information
- Science Observation
- Sequence
- Repeat (1X)
- Scan
- Position-switch basket weave

Scan

Scan Map

General Set

Switching Mode

Position

Noise 0.565 K

Scan setup

Area

Width 180.0 (arcsecs)

Height 180.0 (arcsecs)

PA 0.0 (degrees)

Sample Spacing 7.2761 (arcsecs)

Scan Spacing 7.2761 (arcsecs)

Scan Spacing step 1 sample (7.3")

Heterodyne Details

Scan Strategy Boustrophedon

Sample Time 1.0 (sec)

Default

Secs/Row 67.77 (estimated)

Secs/Observation 1774.26

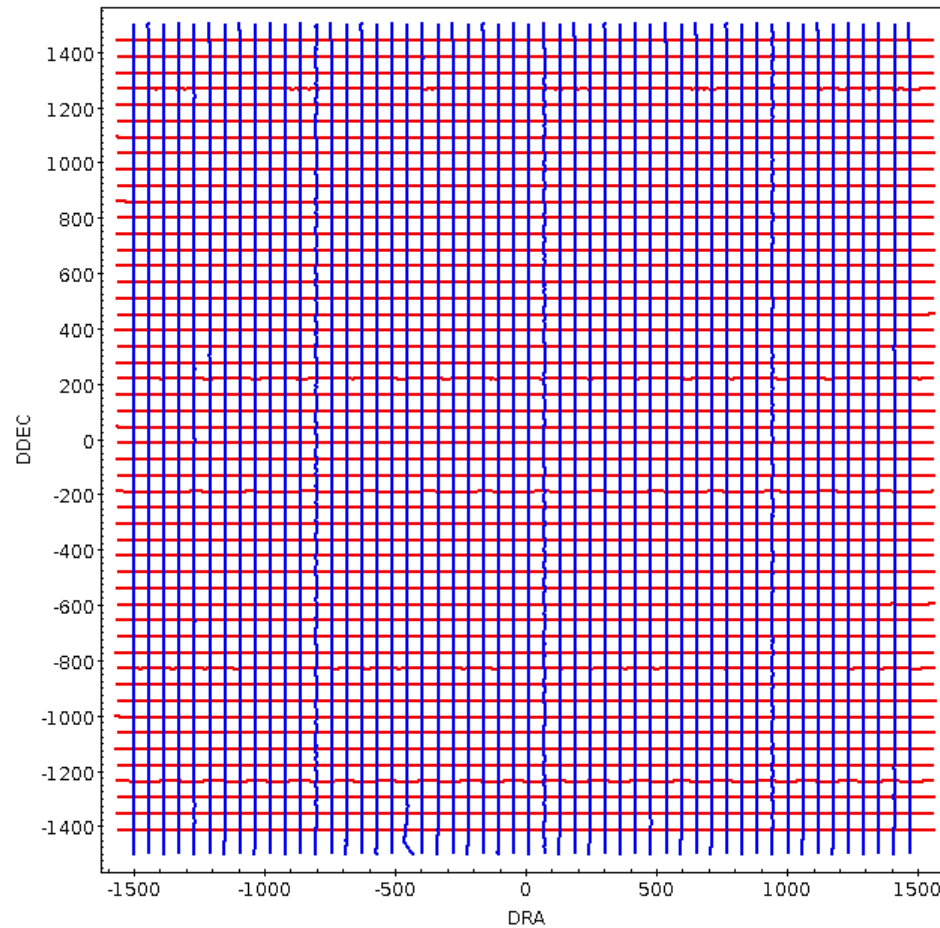
PA automatic (degrees)

System TRACKING

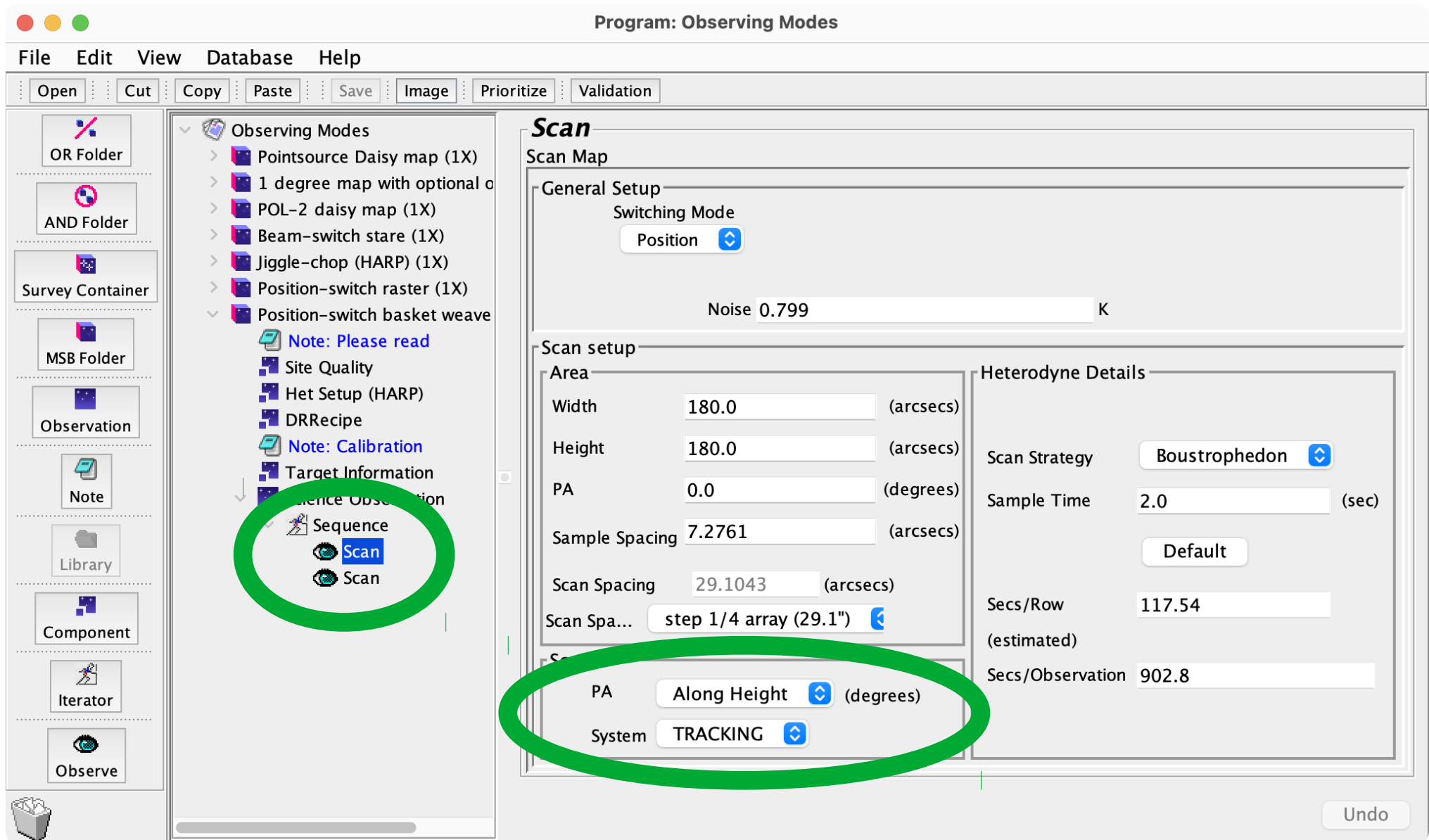
Target requires a reference position

Undo

Raster: basket-weave



Basket-weave MSB



common pitfalls



Pitfalls — software

- Must use Oracle's version of Java.
 - OpenJDK can appear to work at first but problems often occur.
- Sometimes edits only saved on key-press.
 - Information pasted into the OT (e.g. notes) may not be saved.
- OMP automatically updates programs.
 - E.g. observe counters decreased when observed.
 - Always start by fetching from the OMP.

Pitfalls — targets

- Target name vs MSB title:
 - Target name: ideally standard name, shown in archive.
 - MSB title: for your own identification of the MSB.
- Check distance to reference positions:
 - Large distances ($> 1^\circ$) increase overheads.
 - Worst effect when slew is in azimuth at high elevation.
- Position editor:
 - Only plots the component selected in tree.
 - Need to check for offset positions.
 - Only certain FITS formats / projections are supported.

Pitfalls — observing

- Observe counter vs Repeat iterator:
 - MSB observe counter: do MSB multiple times.
 - Repeat iterator: extends duration of a single MSB but may increase overheads.
 - Often more efficient to extend the integration time directly.
- Duration of MSBs:
 - Typically 40 minutes for SCUBA-2.
 - Heterodyne MSBs can be longer, but $\gg 1$ hour becomes hard to schedule during the night.
- Sampling:
 - Aim for adequate (Nyquist) sampling.
 - Data can be smoothed or downsampled later to increase S/N.

tutorial

Tutorial

<https://www.eaobservatory.org/JCMT/user-tutorials/ot-2023/>

https://ftp.eao.hawaii.edu/jcmt/usersmeetings/2023-London/tutorial_ot.tar.gz

- 1) Getting started.
- 2) Organizing programs.
- 3) Understanding the validator.