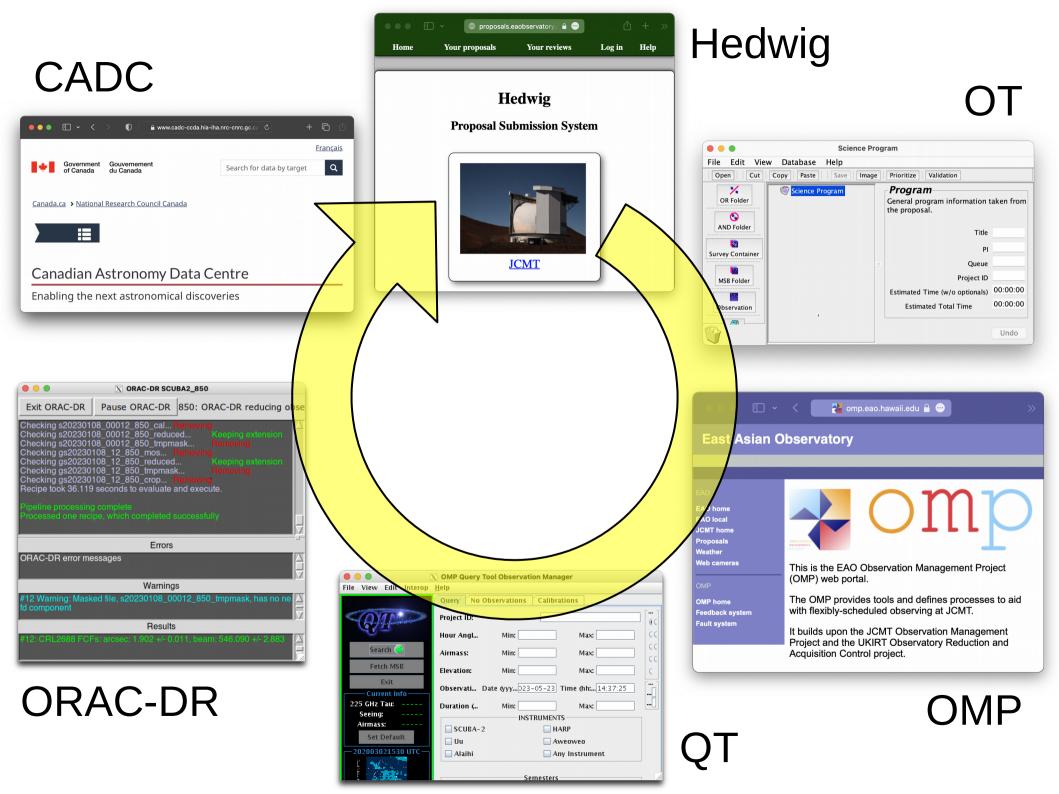
JCMT Project Lifecycle and the Observing Tool

Overview

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

project lifecycle



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.

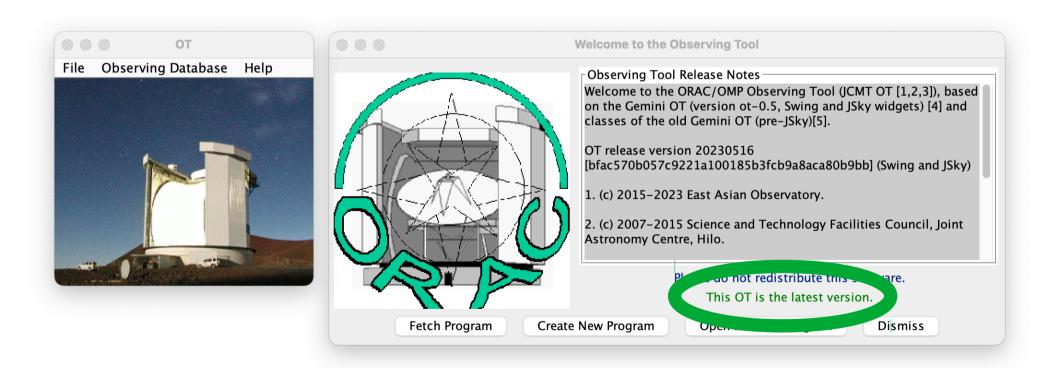
Data uploaded to CADC

- 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

		Science Program	Tool bar	
File Edit	ïew Database Help			
Open	Copy Paste Save Image	Prioritize Validation		
OR Folder	Science Program	General program information	taken from the proposal.	Editin pane
Survey Contai		Title		
Observatio		PI Queue Project ID		
		Estimated Time (w/o optionals)	00:00:00.0	
Library Componen Literator	Progra tree par	Estimated Total Time	00:00:00.0	
Observe	liee par			
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Program items

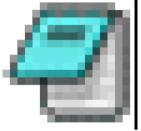














Component

configuration

modifies observation

as part of sequence

triggers taking data

Iterator

"Eye"





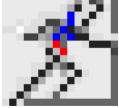
And folder





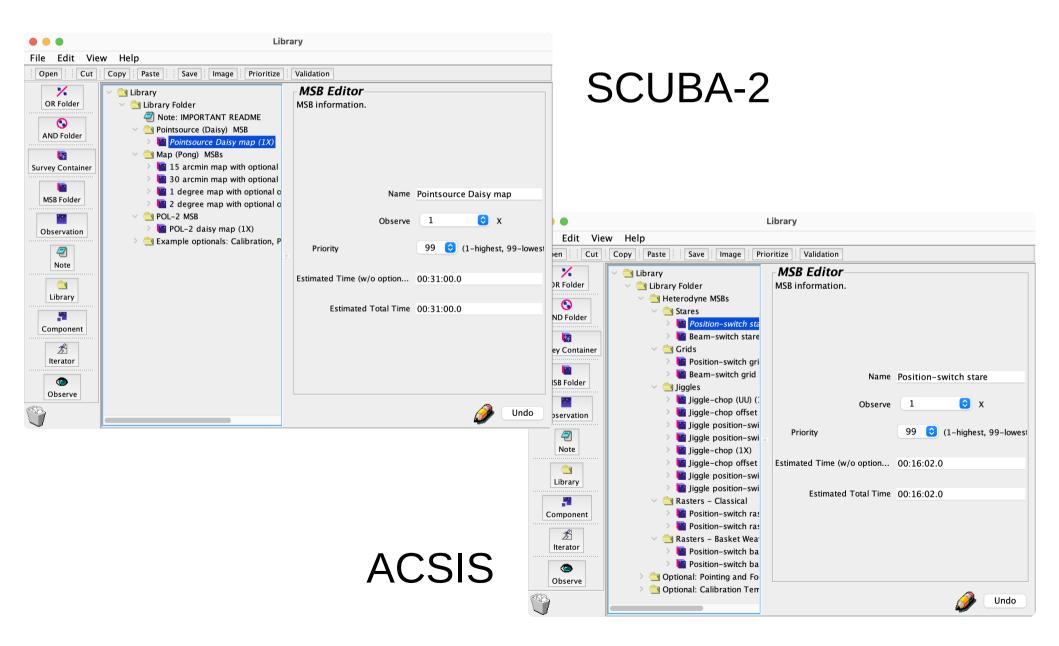




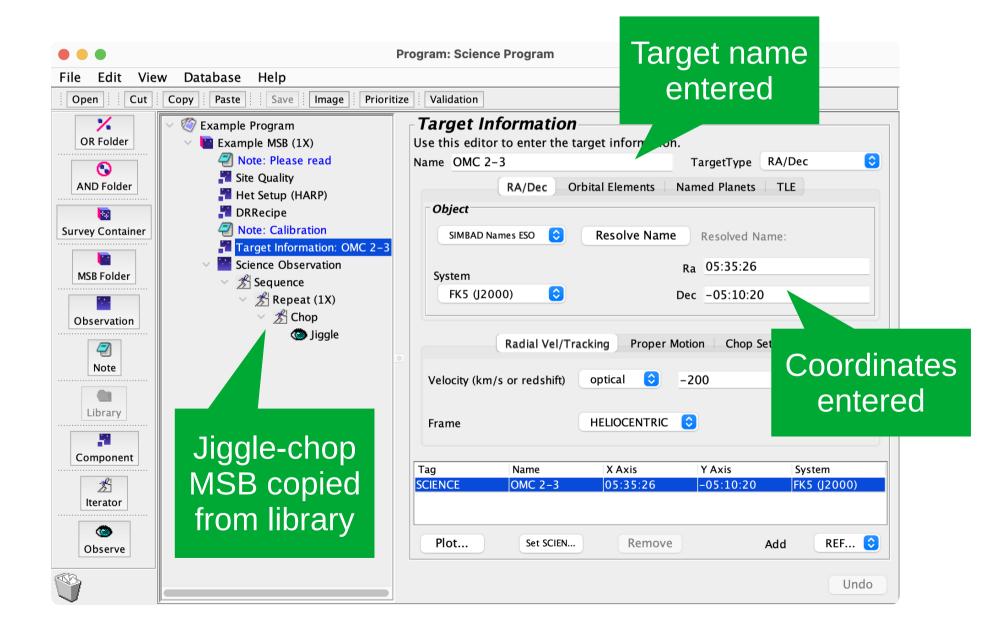




MSB libraries



An example MSB



The position editor Position Editor (Program: Science Program) - jcmts20151226_00036_850_reduced001_obs_000.fits Graphics Catalog File View Go Interop 入 Ē < Mode Mode: buttons Browse Drag Erase F≪ REFERENCE Feature View: buttons SCIENCE REFERENCE Sci Area Catalog Scan Area 2x 628, 483 -0.07287752 05:35:15.138, -05:03:04.99 (J2000)

The position editor — chop

• • • P	osition E	ditor (Pro	gram: Scier	nce Program) - jcmt	s20151226_00036_8	50_reduced001_c	obs_000.fits
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<>>	a [
Mode: Browse Drag Erase REFERENCE							
View: SCIENCE REFERENCE							
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	e q		2x	401.5, 394	-0.015395152	05:36:00.618	-05:07:31.96 (J2000)

Now

selecting

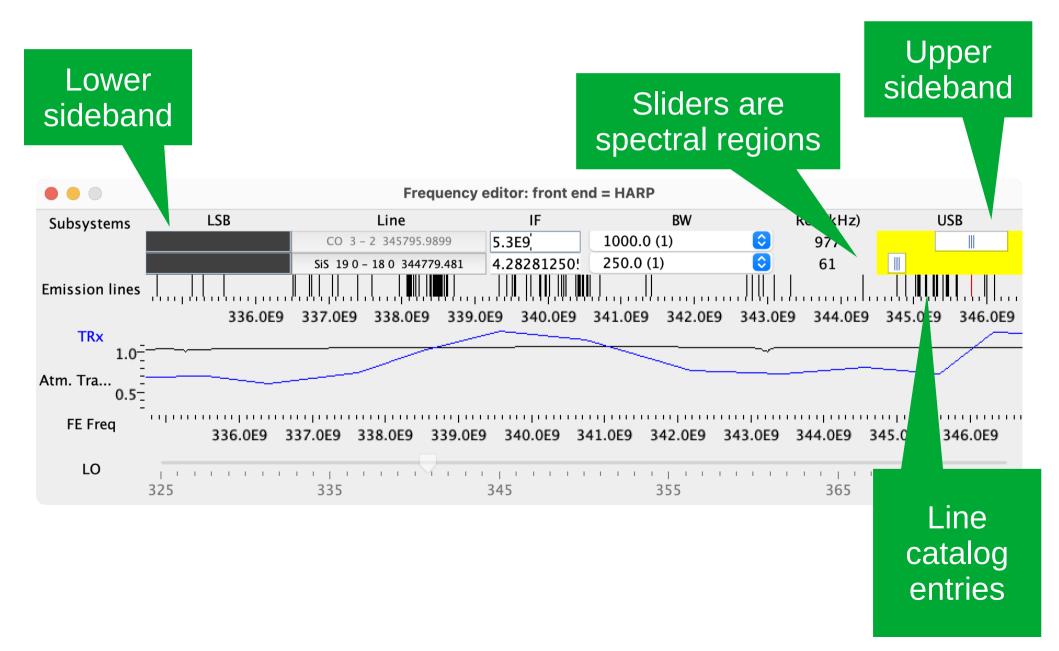
the chop

iterator

Heterodyne setup

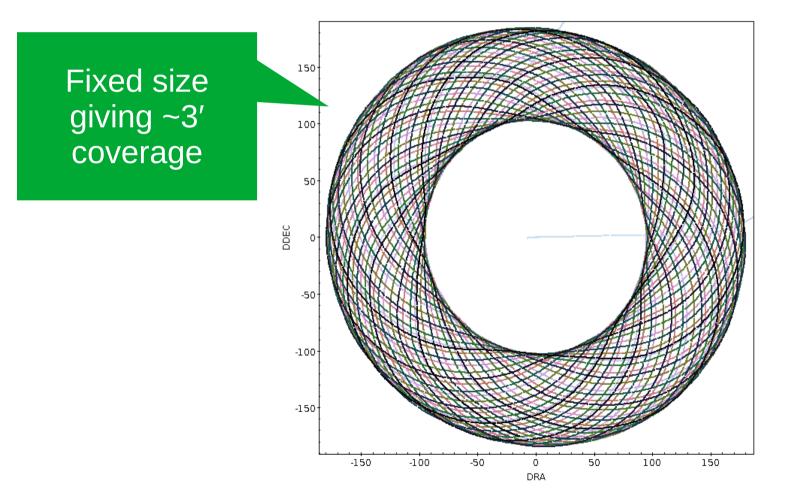
		Program: Science Program	
File Edit Vie	ew Database Help		
Open Cut	Copy Paste Save Mage Priorit	tize	
OR Folder AND Folder	 Example Program Example MSB (1X) Note: Please read Site Quality Het Setup (HARP) DRRecipe Note: Calibration Target Information: OMC 2-3 Science Observation Sequence 	JCMT Heterodyne The Heterodyne instrument is configured with this component. Front End Configuration Front End Configuration Front Uu Aweoweo A3m A3 Front Uu Aweoweo A3m A3 Front WB WD HARP Special C None Special C Mode: Ssb dsb 2sb usb Isb Special C None Special C	Front End Summ Low limit325 High limi375 Bandwidths 1000.0 (1) © 250.0 (1) ©
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الterator (الم			e Frequency Editor
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	Primary	0 CO 3 - 2 345.795985.3E9 1.0E9 977 0.0 1 SiS 19 0 - 18 0 344.779481 4.28281252.5E8 61 0.0	
	subsystem shown here		Undo
d	is "Region 0"		

The frequency editor



observing modes

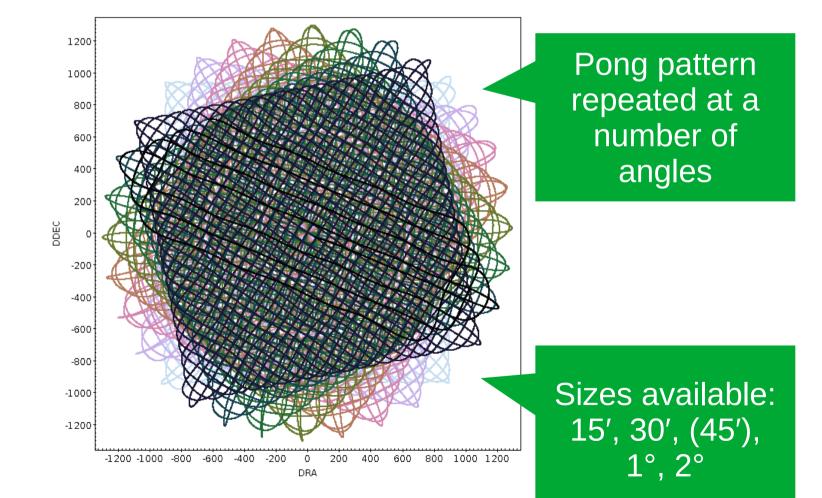
SCUBA-2 daisy



SCUBA-2 daisy MSB

• • •		Program: Obs	erving Mo	des				
File Edit Viev	w Database Help							
Open Cut	Copy Paste Save Image	Prioritize Valida	tion					
×.	Observing Modes							
OR Folder	Pointsource Daisy map	Scan Map						
	Note: Please read	General Setup-						
AND Folder	Site Quality DRRecipe							
	SCUBA-2							
Survey Container	Target Information	Noise 64.	219@450,2	2.794@850	mJy			
	Science Observatior	Scan setup						
MSB Folder	🗸 🎢 Sequence	Area			SCUBA-2 Details			
Mobilion	🕲 <mark>Scan</mark>							
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Observation	 POL-2 daisy map (1X) Beam-switch stare (1X) 	Width	180.0	(arcsec	Integration ti 1800.0	Seconds		
	Jiggle-chop (UU) (1X)	III			Scan speed 50.0	ArcSec/Sec		
Note	 Position-switch raster (Height	180.0	(arcsec)	Scan Strategy			
	> 📔 Position-switch basket	РА	0.0	(d rees)	Point Source			
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Component								
		Scan						
<u>メ</u> Iterator			matic	(degrees)				
iterator				(degrees)				
۲		System FPLA	ANE 🌣					
Observe		h						
						Undo		

SCUBA-2 pong



SCUBA-2 pong MSB

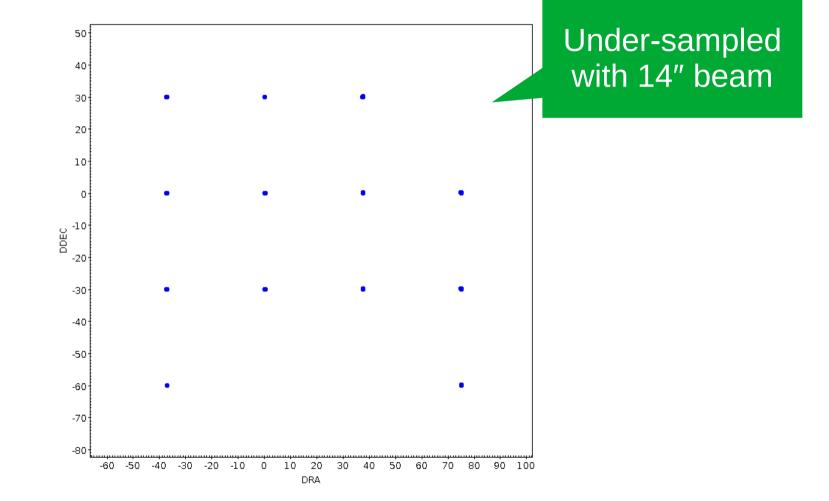
Program: Observing Modes

Open Cut Copy Paste Image Prioritize Validation Validation Validation Validation Validation Validation	
Contraction Scan	
OR Folder I degree map with opt I degree map with opt <td></td>	
Observe Understand	do

SCUBA-2 + POL-2

Program: Observing Modes - - -Edit View Database File Help Open Cut Copy Paste Save Image Prioritize Validation **POL Configuration Iterator** / Observing Modes Iterate over a configuration with this component. **OR** Folder 📔 Pointsource Daisy map 🛅 1 degree map with opi Nothing Selected Available Items 0 POL-2 daisy map (1X) Waveplate Angle AND Folder Note: Please read Site Quality ${}^{*} +$ TRRecipe Survey Container **Iteration** Config (0 Items, 0 Steps) SCUBA-2 Target Information MSB Folder Science Observatior Sequence 숲 V 📌 POL Observation 🔕 Scan Ŧ 7 🛅 Beam-switch stare (1X 📴 Jiggle-chop (UU) (1X) Note \mathbf{X} Position-switch raster (Step **Item** -Position-switch basket Librarv Add Delete Delete - H Component **Continuous** Spin 1 lterator Calibrator In Beam ۲ Observe Undo

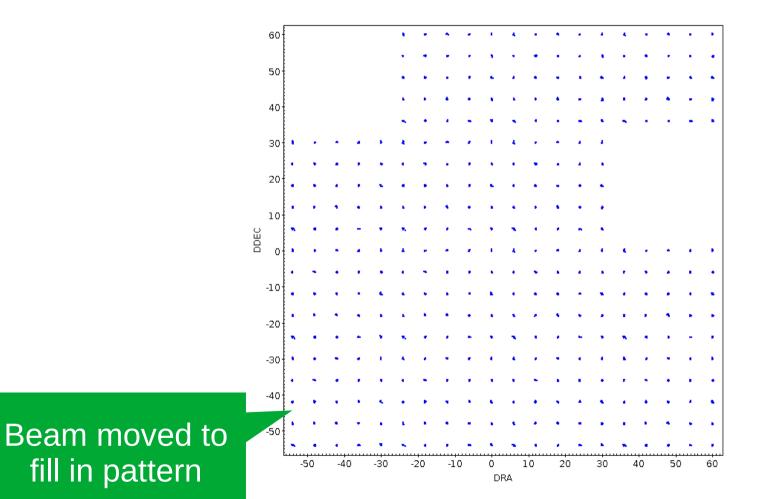
HARP stare



HARP stare MSB

		Program: Obs	erving Modes		
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Open Cut	Copy Paste Save Image Pr	oritize Validation			
Component Correction Correction Correction Cobservation Cobservation Component Component Component Component	 Observing Modes Pointsource Daisy map (1X) 1 degree map with optional c POL-2 daisy map (1X) Beam-switch stare (1X) PoL-2 daisy map (1X) Beam-switch stare (1X) Note: Please read Site Quality Het Setup (HARP) DRRecipe Note: Calibration Target Information Science Observation Science Observation Sequence Sequence Sequence Stare Jiggle nop (UU) (1X) Potent-switch raster (1X) Potent-switch raster (1X) Potent-switch basket weave 	Stare Observation I Stare Observation I Switching Mode Beam Stare Setup Map Warning: Using conti	Noise 0.157 Rotator Angles If your program requires so of the array, select accept Otherwise please leave all an automatic selection. 0.0 90.0 Secs per offset s Continuum Mode PA 0.0 System TRAC nuum mode will significantly increa- puld only be used if an accurate m	able rotator angles. angles unchecked for 180.0 270.0 ample <u>360</u> e (degrees)	Undo
					0.140

HARP-5 jiggle

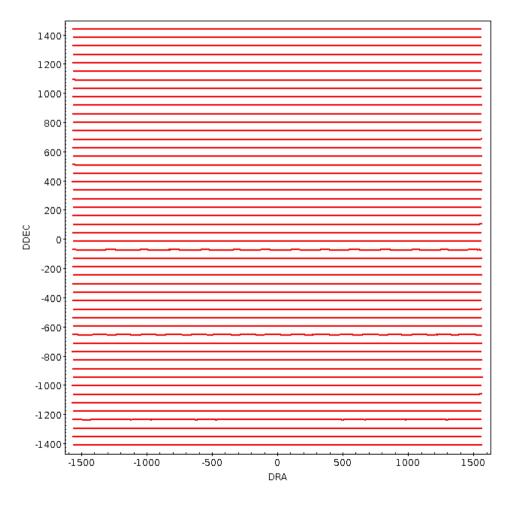


HARP-5 jiggle MSB

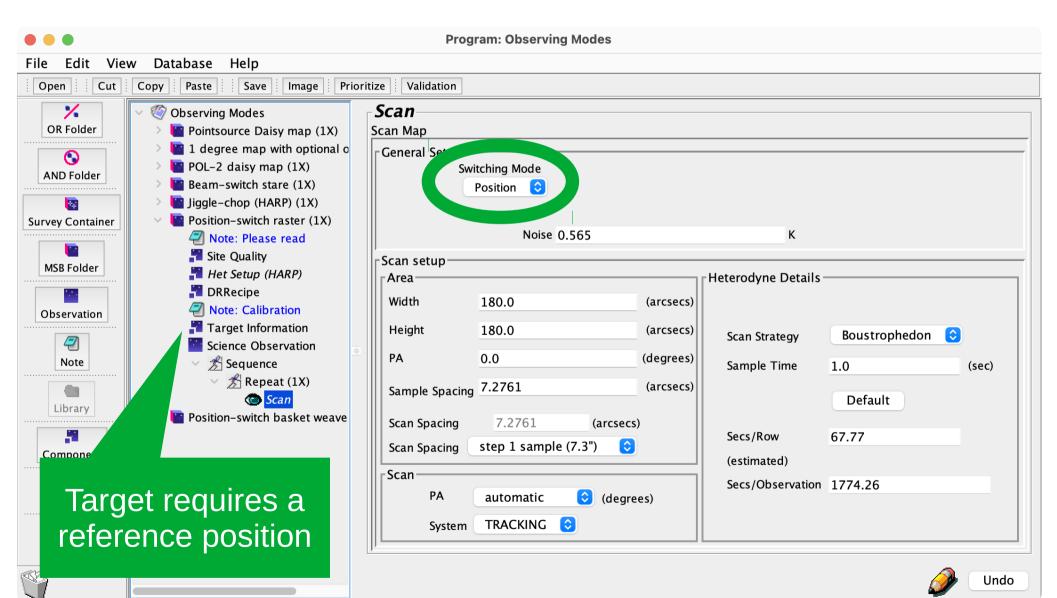
File Edit View Database Help Open Cut Copy Paste Save Image Prioritize Validation			Program: Observing Modes
Image: Second	File Edit Vie	w Database Help	
OR Folder > Pointsource Daisy map (1X) Idegree map with optional o > POL-2 daisy map (1X) AND Folder > POL-2 daisy map (1X) Idegree map with optional o > POL-2 daisy map (1X) Idegree map with optional o > POL-2 daisy map (1X) Idegree map with optional o > POL-2 daisy map (1X) Idegree map with optional o > POL-2 daisy map (1X) Idegree map with optional o > Pol-12 daisy map (1X) Idegree map with optional o > Pol-2 daisy map (1X) Idegree map with optional o > Pol-2 daisy map (1X) Idegree map with optional o > Pol-2 daisy map (1X) Idegree map with optional o > Pol-2 daisy map (1X) Idegree map with optional o > Pol-2 daisy map (1X) Idegree map with optional o > Pol-2 daisy map (1X) Idegree map with optional o > Pol-2 caisy map (1X) Idegree map with optional o > Separate Offs Noise 0.515 K Noise 0.515 K Idegree map with optional o > Pol-2 caisy map (1X) Idegree map with optional o > Position-switch basket weave Idegree position - switch basket weave Idegree position - switch basket weave	Open Cut	Copy Paste Save Mage Pri	ritize
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	OR Folder AND Folder Survey Container MSB Folder Observation Observation Component Component Component	 Pointsource Daisy map (1X) Pointsource Daisy map (1X) POL-2 daisy map (1X) POL-2 daisy map (1X) Beam-switch stare (1X) Beam-switch stare (1X) Jiggle-chop (HARP) (1X) Note: Please read Site Quality Het Setup (HARP) Site Quality Het Setup (HARP) DRRecipe Note: Calibration Target Information Science Observation Science Observation Sequence Sequence Sequence Chop Iggle Position-switch raster (1X) 	Jiggle Observation Mode General Setup Switching Mode Beam Separate Offs Noise 0.515 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 Jiggle setup Jiggle Pattern HARP5 Image: Continuum Mode Secs/Jig posn 20 Continuum Mode PA 0.0 (degrees) System TRACKING Image: 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. Image: Continuum mode will significantly increase the duration of the continuum emission

~ 2

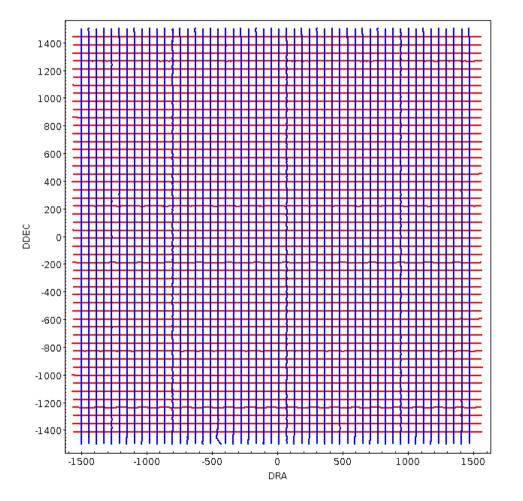
Raster



Raster MSB



Raster: basket-weave



Basket-weave MSB

Program: Observing Modes

File Edit Vie	w Database Help						
Open Cut	Copy Paste Save Mage Pri	oritize Validation					
Open Cut Cut OR Folder Cut OR Folder Survey Container MSB Folder	Copy Paste Save Image Pri Observing Modes Pointsource Daisy map (1X) 1 degree map with optional o POL-2 daisy map (1X) Beam-switch stare (1X) Beam-switch stare (1X) Jiggle-chop (HARP) (1X) Position-switch raster (1X) Position-switch basket weave Note: Please read Site Quality Het Setup (HARP) DRRecipe Note: Calibration Target Information 	Scan Map General Setup Switchin Posit Scan setup Area Width Height	ion 📀 Noise 0.799 180.0 180.0	(arcsecs) (arcsecs)	K Heterodyne Detai Scan Strategy		
Note Library Component Iterator Observe	Sequence Secan Scan Scan	PA A	29.1043 (art tep 1/4 array (29.1")	(degrees) (arcsecs) csecs))	Sample Time Secs/Row (estimated) Secs/Observation	2.0 Default 117.54 902.8	(sec) Undo

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°) 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 >> 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.