

Available Proposal Tools: APT

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The JWST Astronomer's Proposal Tool



The **Astronomer's Proposal Tool (APT)** is used to specify proposed observations for JWST and submit them for consideration, by the Time Allocation Committee (TAC).

- The scientific justification PDF must be attached, at the bottom of the Proposal Information page, prior to submission.

APT is also a resource estimator.

- Need a resource estimate for the TAC.
- APT uses a system of overhead charges to make this resource estimate possible.

APT Basics



- **Observation** – basic proposal design element specified by the user. Observations are divided into one or more visits by APT.
- **Visit** – set of exposures (included overheads) obtained on a single guide star without scheduling interruptions. (This is the scheduling unit.)
- **Observation Template** – GUI form filled out by the user.
- **Overhead** – charged time for operations activities performed by the observatory.
- **Graphical Timeline** – provides a visual display of overheads for each visit.
- **Visit Planner** – checks the schedulability of an observation (including guide star availability).
-
- **Smart Accounting** – updates the full proposal's resource estimates and remove excess overheads prior to submission.

What is an APT Observation?



- User specified
- Single observing mode (template)
- All parameters for exposures and scheduling requests

MIRI Medium Resolution Spectroscopy

Instrument: MIRI

Template: MIRI Medium Resolution Spectroscopy

Target: 3 HH-111

Visit Splitting: 70.0 Arcsec

Number of Visits: 1

Duration (secs): 448

Science: 5506

Total Charged: 5506

Data Volume: 1134 MB

Mosaic Properties

Special Requirements

Comments

Target Acquisition Parameters

Acq Target	Acq Filter
4 SOMESTAR	F560W

Acq Readout Pattern

Acq Groups/Int

Acq Integrations/Exp

Acq Total Integrations

Acq Total Exposure Time

Acq ETC Wkbk

Acq Exposure Time: FAST

Acq Groups/Int: 10

Acq Integrations/Exp: 1

Acq Total Integrations: 1

Acq Total Exposure Time: 27.75

Acq ETC Wkbk: 99999

MRS Parameters

Primary Channel: ALL

Dithers:

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED SOURCE	NEGATIVE

Add

Duplicate

Insert Above

Remove

Simultaneous Imaging: YES

Imager Subarray: FULL

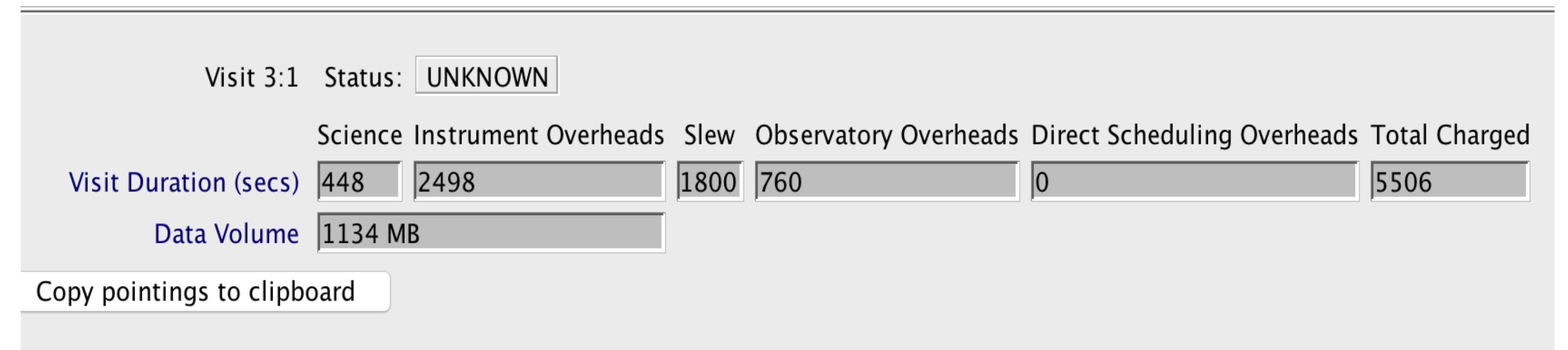
#	Detector	Wavelength	Filter	Readout P...	Groups/Int	Integratio...	Exposure...	Dither	Total Dith...	Total Inte...	Total Exp...
1	IMAGER		F1000W	FAST	5	1	1	Dither 1	4	4	55.501
1	MRSLONG	SHORT(A)		FAST	10	1	1	Dither 1	4	4	111.002
1	MRSSHORT	SHORT(A)		FAST	10	1	1	Dither 1	4	4	111.002

Additional Resource: [JDox Article: APT Observations](#)

What is an APT Visit?



- A Visit is set of exposures and associated overheads that can be executed, without interruption, using a single guide star.
 - This is what makes Visits the “scheduling unit” used by the scheduling system.
- A typical Visit includes
 - Slew to guide star position
 - Instrument overheads
 - Guide star acquisition
 - Target acquisition (if needed)
 - Small Angle Maneuvers (SAMs)
 - Science exposures



- The duration of a Visit also includes:
 - Observatory overheads
 - Station keeping
 - Momentum management
 - Direct scheduling overheads
 - Very tight timing constraints
 - Rapid turnaround of target of opportunities

APT shows the following when clicking on a Visit, which cannot be directly edited, and is for user information only.

APT Visit Splitting Distance



- Users specify observation, then APT splits an observation into one or more Visits depending on the Visit Splitting Distance.
- This allowed distance for offsets (or dithers) within a Visit is based on the expected guide star availability, which drop off towards higher galactic latitudes.
- The Visit Splitting Distance used by APT is between 35"–80" depending on the Galactic latitude of the target. Exceptions:
 - 30" for moving targets
 - 38" for WATA Target Acq for NIRSpec
- The Visits of a multi-visit observation are not guaranteed to execute in a continuous manner unless a special requirement (to be discussed in more detail later) is specified.

Galactic Latitude	Pointing Change	Galactic Latitude	Pointing Change
$0^\circ \leq b < 10^\circ$	80"	$45^\circ \leq b < 50^\circ$	45"
$10^\circ \leq b < 15^\circ$	70"	$50^\circ \leq b < 60^\circ$	40"
$15^\circ \leq b < 20^\circ$	65"	$60^\circ \leq b < 65^\circ$	30"
$20^\circ \leq b < 25^\circ$	60"	$65^\circ \leq b < 70^\circ$	40"
$25^\circ \leq b < 35^\circ$	55"	$70^\circ \leq b < 80^\circ$	35"
$35^\circ < b < 45^\circ$	50"	$ b > 80^\circ$	45"

Target: 10 M-82

	Splitting Distance	Number of Visits
Visit Splitting:	50.0 Arcsec	1

Science Total Charged

Duration (secs)	
43	2841

Data Volume: 217 MB

Ex: At the Observation-level, the target is M-82, which has a visit splitting distance of 50.0"

Additional Resource: [JDox Article: APT Visit Splitting](#)



APT Observation Templates

APT Observation Templates



- Template Form changes based on selection of instrument and observing mode.
- APT templates give users access to all supported JWST observing modes.

Additional Resource: [JDox Article: APT Observation Templates](#)

APT Observation Templates



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- APT templates give users access to all supported JWST observing modes.
- Examples:
 - ▶ Coronagraphy

Instrument: MIRI

Template: MIRI Coronagraphic Imaging

Target: 6 BET-PIC

Visit Splitting: 55.0 Arcsec | Number of Visits: 1

Duration (secs): 959 | Science: 4566 | Total Charged: 4566

Data Volume: 730 MB

MIRI Coronagraphic Imaging | Special Requirements | Comments

Target Acquisition Parameters

Acq Target	Acq Filter
Target ACQ: Same Target as Observation	FND

Acq Readout Pattern	Acq Groups/Int	Acq Integrations/Exp	Acq Total Integrations	Acq Total Exposure Time	Acq ETC W
Acq Exposure Time: FAST	6	1	1	1.438	99999

Acq Quadrant
1

Coron Parameters

Coron Mask/Filter	Mask	Filter
Coron Filter: 4QPM/F1065C	4QPM	F1065C

Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC W
Exposure Time: FAST	40	100	1	1	100	958.72	99999

Dither Type
NONE

Additional Resource: [JDox Article: APT Observation Templates](#)

APT Observation Templates



- Template Form changes based on selection of instrument and observing mode.
- APT templates give users access to all supported JWST observing modes.
- Examples:
 - ▶ Coronagraphy
 - ▶ Mosaiking

Screenshot of the APT Observation Template configuration interface, specifically the "Mosaic Properties" tab. The "Mosaic Properties" tab is highlighted with a yellow border.

The form includes the following settings:

- Rows: 1
- Columns: 1
- Row Overlap %: 10.0
- Column Overlap %: 10.0
- Row shift: 0.0
- Column shift: 0.0
- Tile Order: DEFAULT

A note below the controls states: "There are one or more visits for each tile so tile ordering has no effect".

Below the controls is a "View in Aladin" button.

The "Mosaic Tiles" section displays a table with the following data:

Tile Number	Tile State	Visits
1	Tile Included	[8:1, 8:2, 8:3]

Additional Resource: [JDox Article: APT Observation Templates](#)

APT Observation Templates



- Template Form changes based on selection of instrument and observing mode.
- APT templates give users access to all supported JWST observing modes.
- Examples:
 - ▶ Coronagraphy
 - ▶ Mosaicing
 - ▶ Coordinated Parallels

Prime Instrument: NIRCAM

Template: NIRCam Imaging

Coordinated Parallel NIRCam-MIRI Imaging

	NIRCam Imaging	MIRI Imaging	Mosaic Properties	Special Requirements	Comments				
Module	ALL								
Subarray	FULL								
Dither Parameters	FULL	9	3-POINT-WITH-MIRI-F560W						
FULL* dither types take large steps that result in variable depth over the imaged area. Review coverage in Aladin and compensate in ETC.									
	#	Short Filter	Long Filter	Readout Patte...	Groups/Int	Integrations/...	Total Dithers	Total Integrati...	Total
	1	F200W	F444W	DEEP2	10	1	27	27	52

Additional Resource: [JDox Article: APT Observation Templates](#)

APT Target Acquisition



- The target acquisition target should be the brightest source in the Region Of Interest (ROI).
- Some APT templates...
 - Have no target acquisition
 - Require a target acquisition
 - Or the target acquisition is optional
 - Consider your science case and expected pointing performance to decide whether a TA is necessary.

Target Acquisition Parameters

Acq Target	Acq Filter					
Target ACQ 4 SOMESTAR	F560W					
Acq Readout Pattern	Acq Groups/Int	Acq Integrations/Exp	Acq Total Integrations	Acq Total Exposure Time	Acq ETC Wkbk.Calc ID	ETC
Acq Exposure Time FAST	10	1	1	27.75	99999	<input type="button" value=""/>

Useful: annotation box, useful for documenting your calculation ID!

Additional Resources:

- [JDox Article: APT Target Acquisition](#)
- [JDox Article: APT to ETC Connectivity](#)

APT Target Acquisition



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- Some APT templates...
 - Have no target acquisition
 - Require a target acquisition
 - Or the target acquisition is optional
 - Consider your science case and expected pointing performance to decide whether a TA is necessary.

NOTE: If the target acquisition fails, the observation fails!

Users should obtain accurate target acquisition exposure information using the [JWST Exposure Time Calculator](#) and transfer to APT.

▼ Target Acquisition Parameters

Acq Target	Acq Filter	Acq Readout Pattern	Acq Groups/Int	Acq Integrations/Exp	Acq Total Integrations	Acq Total Exposure Time	Acq ETC Wkbk.Calc ID	ETC
Target ACQ 4 SOMESTAR	F560W					27.75	99999	<input type="button" value=""/>
Acq Exposure Time FAST	10			1	1			

Useful: annotation box, useful for documenting your calculation ID!

Additional Resources:

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APT Special Requirements

Special Requirements



- Additional constraints placed on specific observations.
 - ▶ Applied at the observation level.
 - ▶ Affects all visits within an observation
 - ▶ **Must be justified by the science goals**
- Can decrease scheduling availability

	NIRCam Imaging	MIRI Imaging	Mosaic Properties	Special Requirements	Comments
Special Requirements	Aperture PA Range 149.887474 to 149.887474 Degrees (V3 150.0 to 150.0) No Parallel				
	Add...	Remove	Edit		
Implicit Requirements	Group Visits within 53.0 Days Visits Same PA				
	Edit				

Additional Resources:

- [JDox Article: APT Special Requirements](#)
- [YouTube Video Tutorial: APT Special Requirements](#)

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- Explicit requirements: set by user
- Implicit requirements: set by APT and reported for your information.

	NIRCam Imaging	MIRI Imaging	Mosaic Properties	Special Requirements	Comments
Special Requirements	Aperture PA Range 149.887474 to 149.887474 Degrees (V3 150.0 to 150.0) No Parallel				
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Special Requirements



- Additional constraints placed on specific observations.
 - ▶ Applied at the observation level.
 - ▶ Affects all visits within an observation
 - ▶ **Must be justified by the science goals**
- Can decrease scheduling availability
- Explicit requirements: set by user
- Implicit requirements: set by APT and reported for your information.
- Examples: Timing, Position Angle, Target of Opportunity, Background Limited, Offset, No Parallel

	NIRCam Imaging	MIRI Imaging	Mosaic Properties	Special Requirements	Comments
Special Requirements				<p>Aperture PA Range 149.887474 to 149.887474 Degrees (V3 150.0 to 150.0)</p> <p>No Parallel</p>	
				<p>Add...</p> <p>Remove</p> <p>Edit</p>	
Implicit Requirements				<p>Group Visits within 53.0 Days</p> <p>Visits Same PA</p>	<p>Edit</p>

Additional Resources:

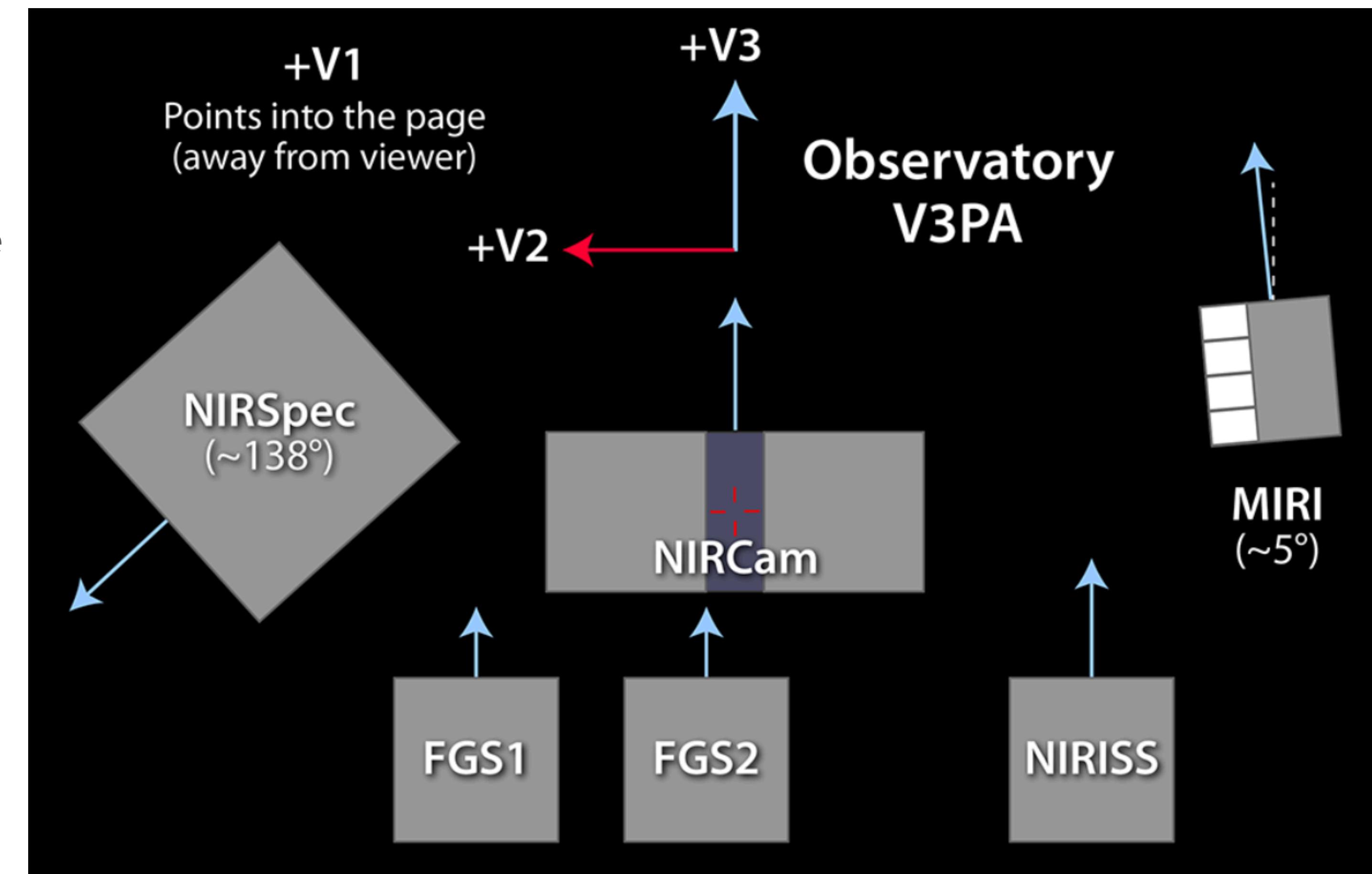
- [JDox Article: APT Special Requirements](#)
- [YouTube Video Tutorial: APT Special Requirements](#)

V3 Position Angle (V3PA) vs Aperture Position Angle (APA)



- V3PA is the observatory reference angle used by APT diagnostics and the scheduling system.
- APA is specific to each instrument, and is the PA (degrees east of north as projected onto the sky) of the reference axes shown as light blue arrows at left.

Instrument	Offset Angle from V3
NIRCam	0.0°
MIRI	4.45°
NIRISS	0.57°
NIRSpec	138.5°



Additional Resource: [JDox Article: Position Angles, Ranges and Offsets](#)



APT Visit Planner

APT Visit Planner

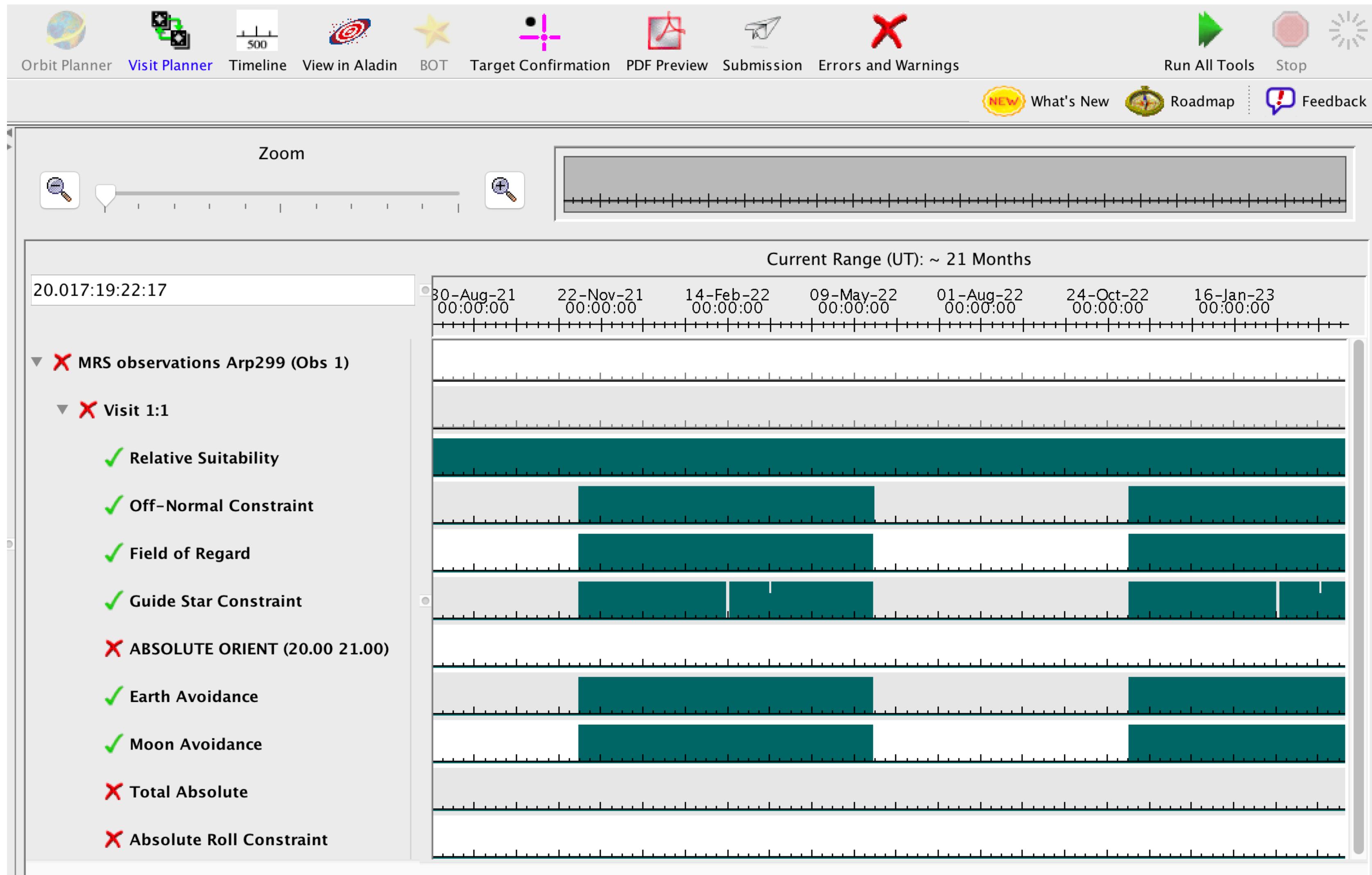


- The APT visit planner performs a detailed check of the schedulability of the visits in observations, including target visibility, constraint checking, and whether guide stars are available.
- Diagnostic information is provided when scheduling checks fail. But interpreting this information can be tricky.

Additional Resources:

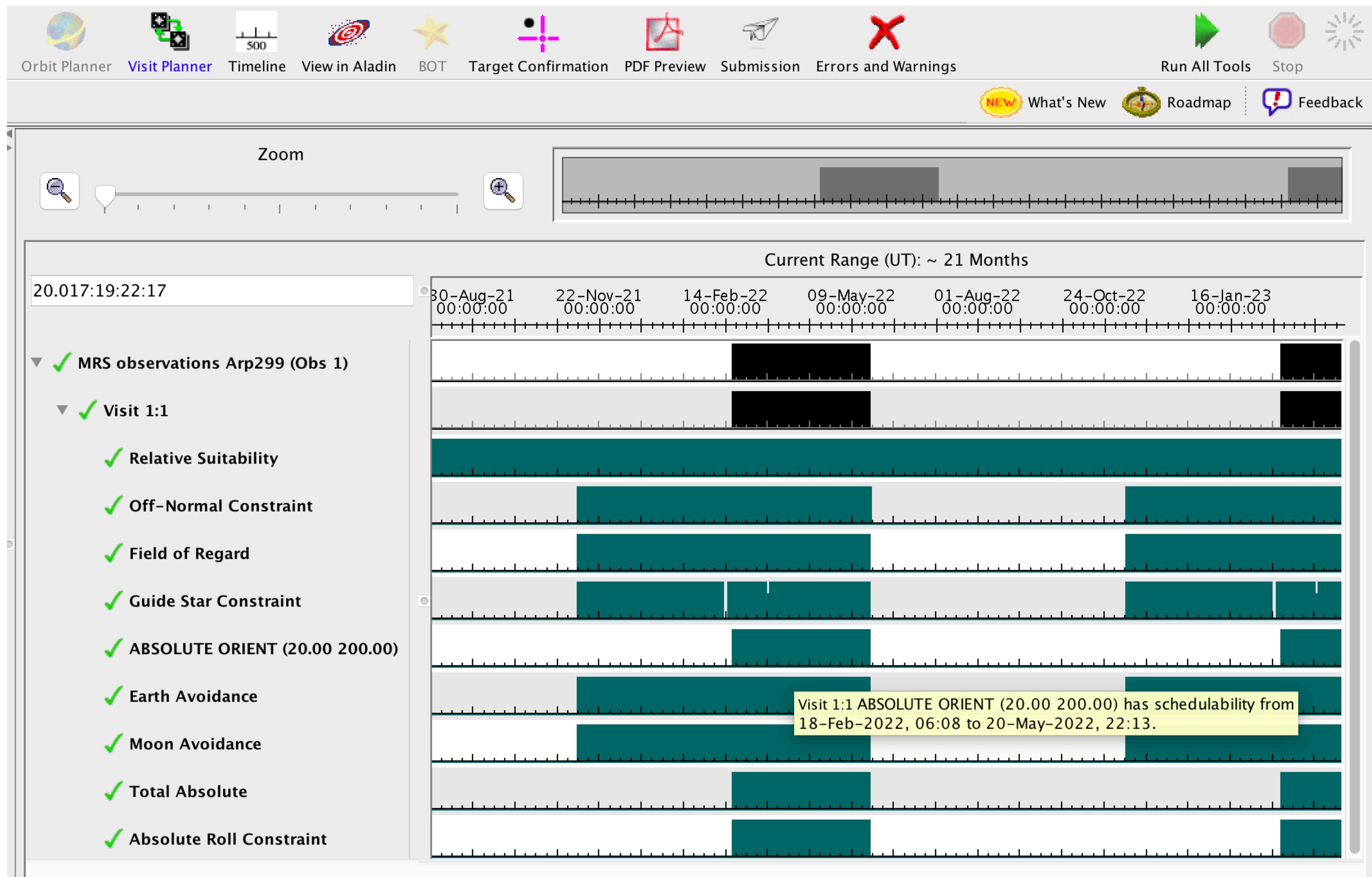
- [JDox Article: APT Visit Planner](#)
- [YouTube Video Tutorial: APT Visit Planner](#)

APT Visit Planner Diagnostics – Position Angle Problems



Note: all constraints windows need to have a window of schedulability at the same time.

APT Visit Planner Diagnostics – Position Angle Problems



Now it is
schedulable!

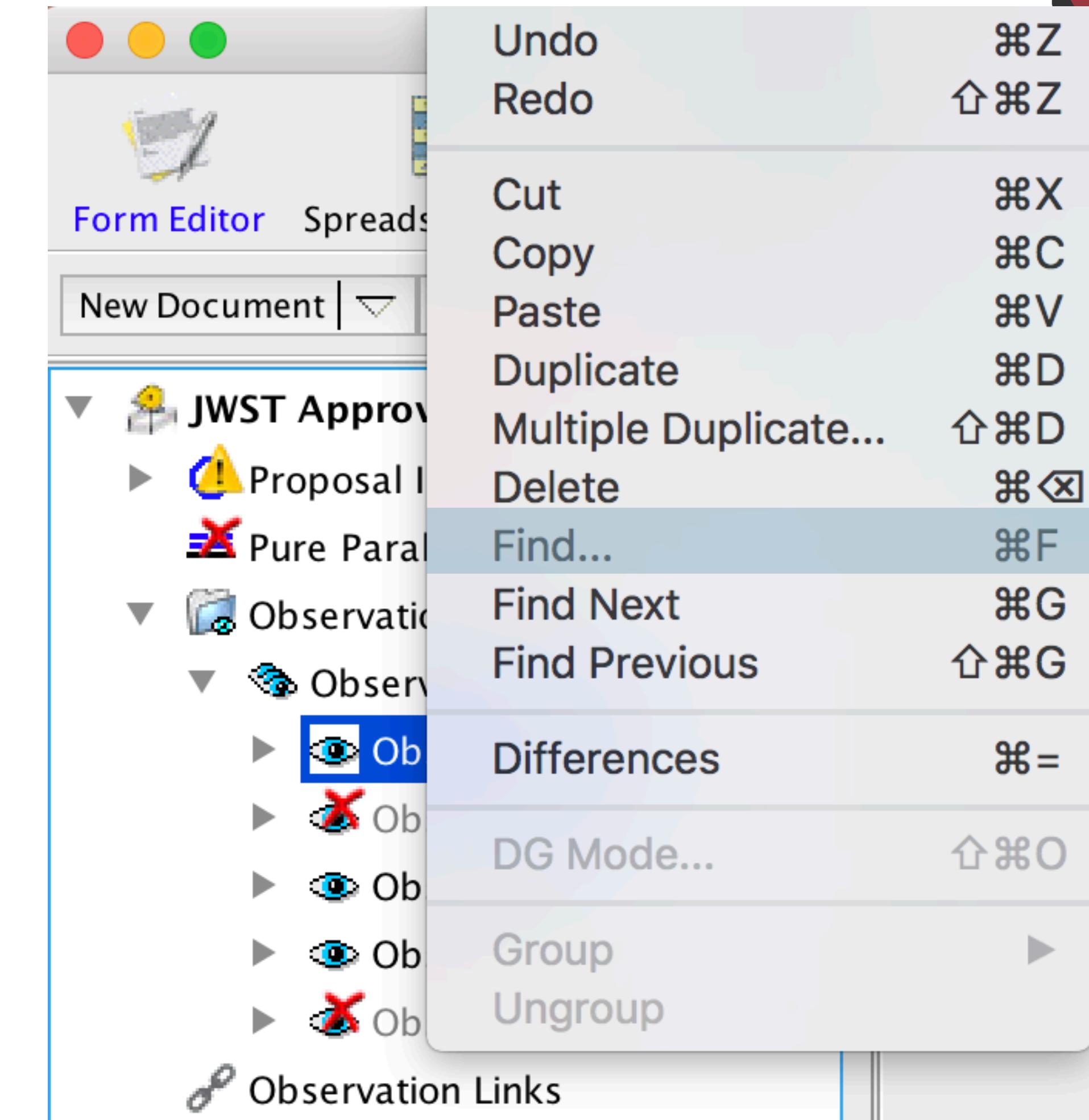


Other Useful APT Capabilities

Other Useful APT Capabilities



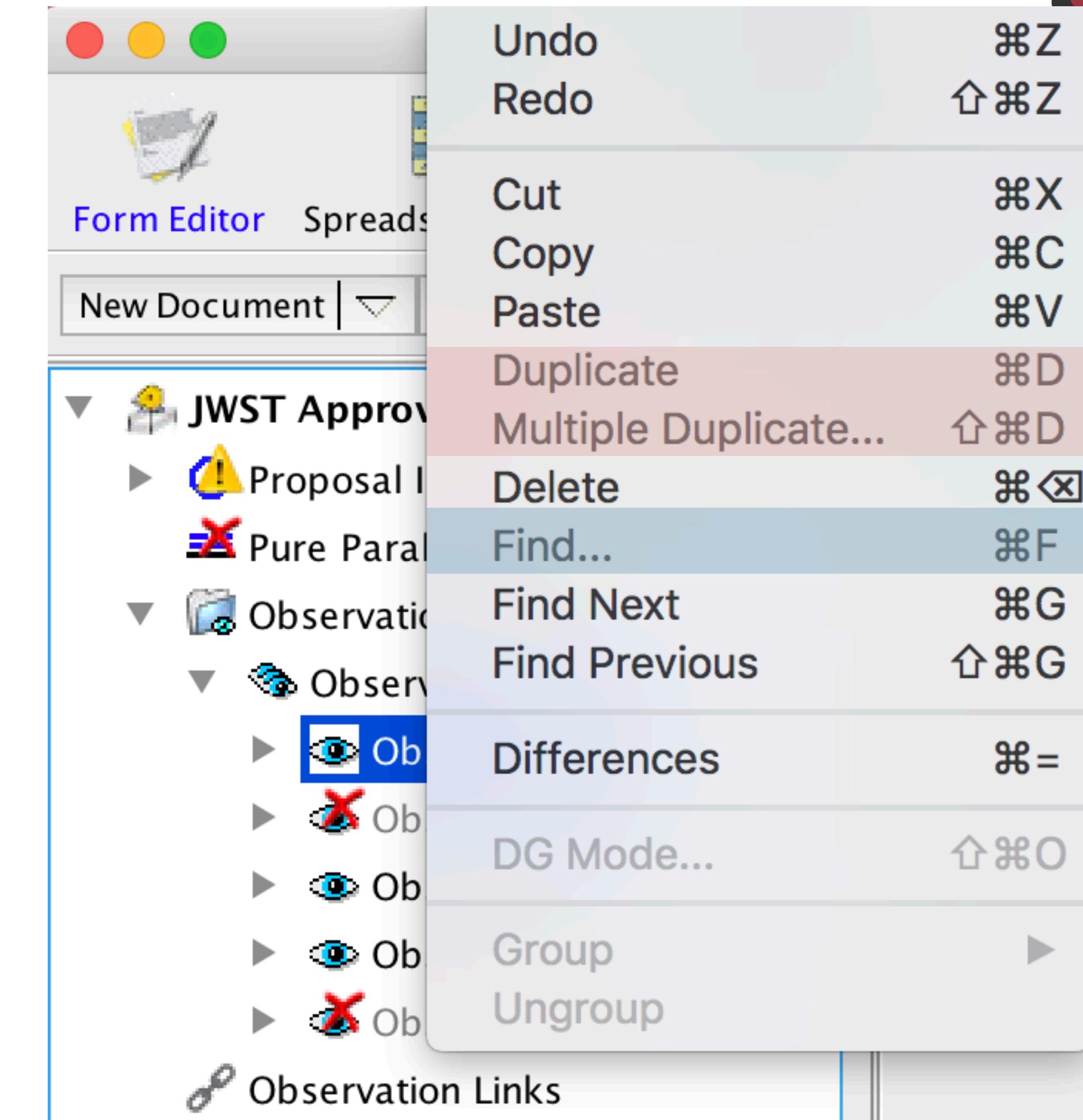
- **Find** – can search on any part of the APT file (proposal info, target, observation, etc.)



Other Useful APT Capabilities



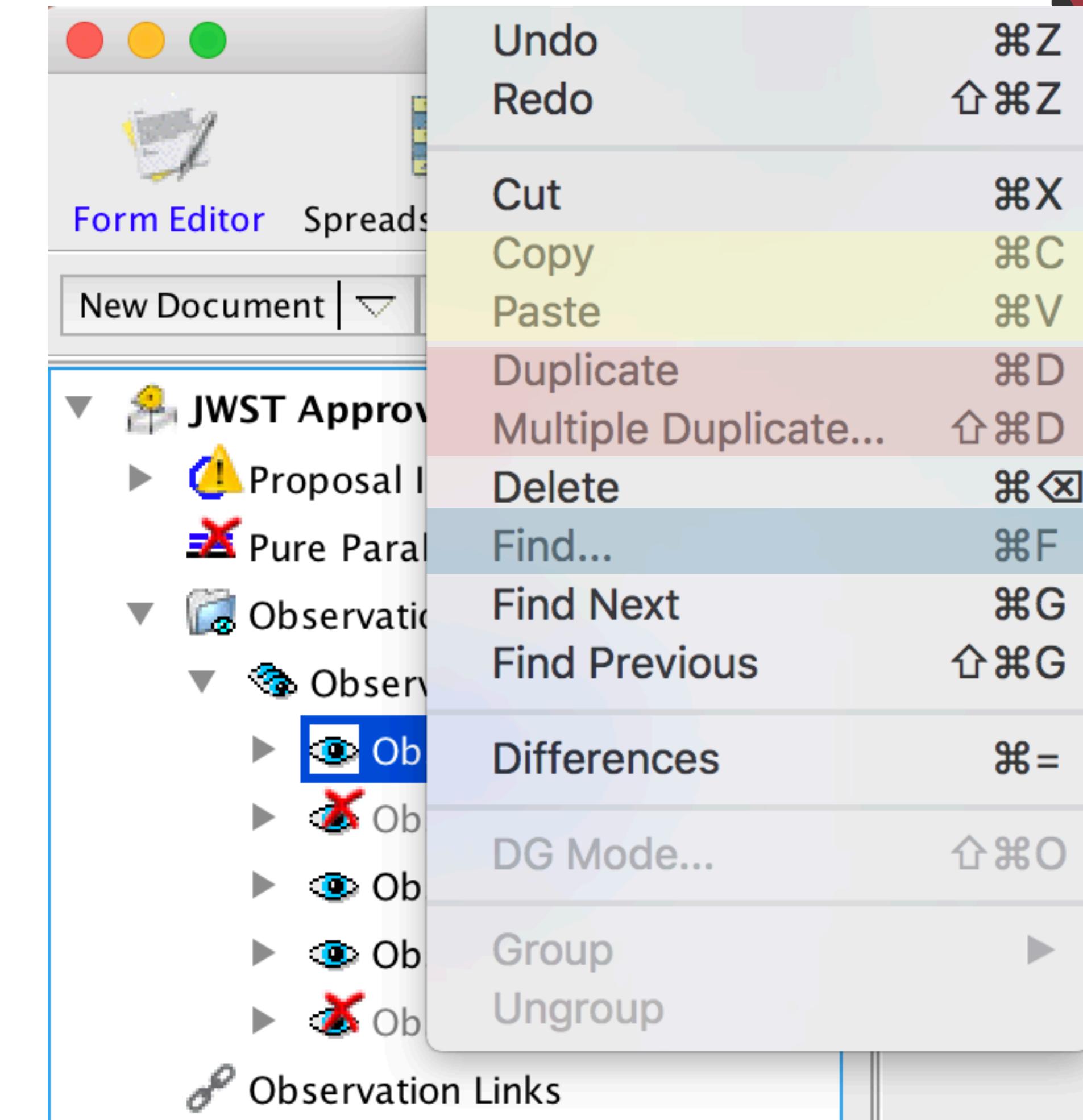
- **Find** – can search on any part of the APT file (proposal info, target, observation, etc.)
- **Duplicate/Multiple Duplicate** a target, observation folder or observation



Other Useful APT Capabilities



- **Find** – can search on any part of the APT file (proposal info, target, observation, etc.)
- **Duplicate/Multiple Duplicate** a target, observation folder or observation
- Copy/Paste a target, observation folder, or observation within your proposal or into a separate proposal.

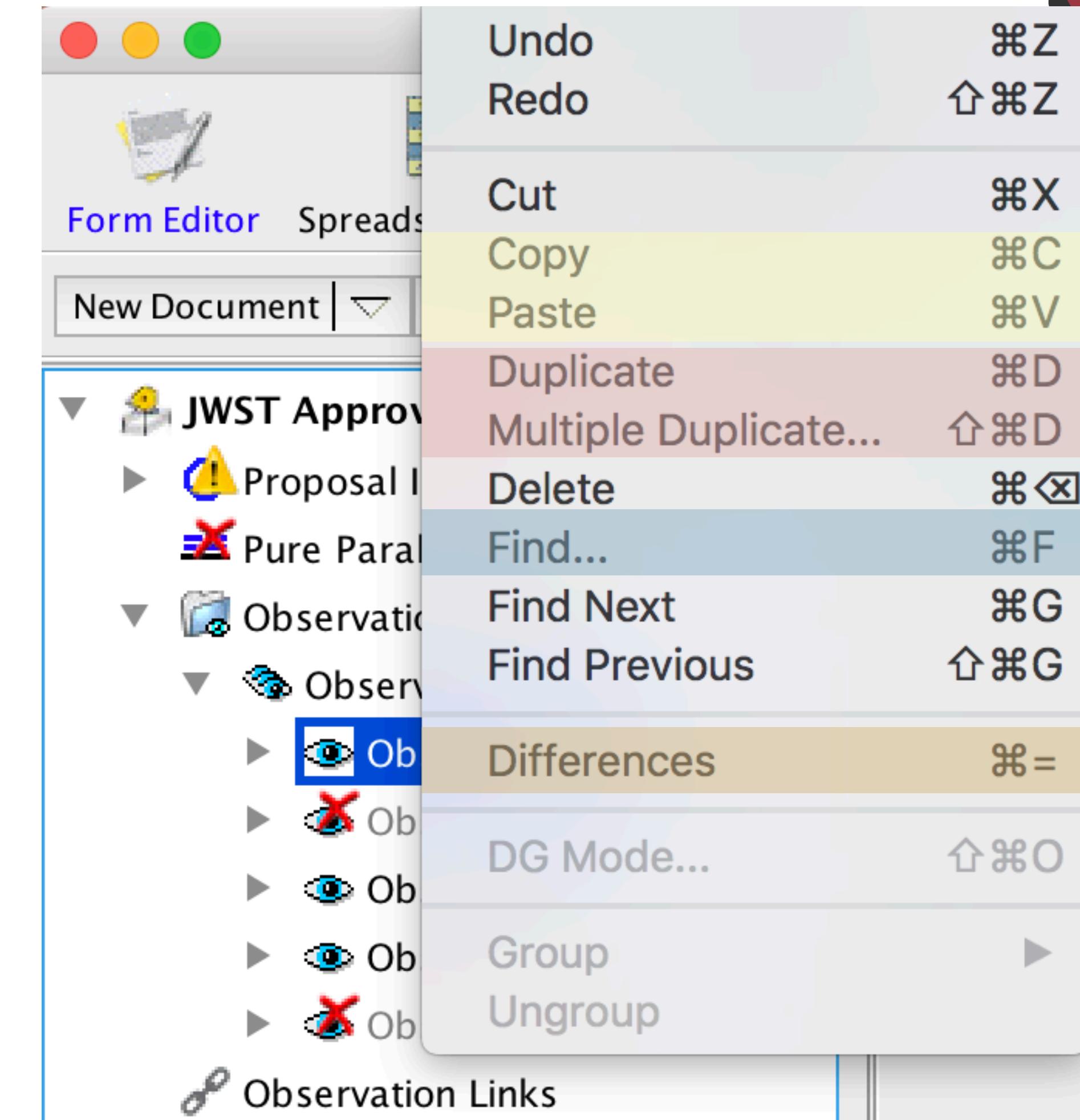


Other Useful APT Capabilities



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- **Duplicate/Multiple Duplicate** a target, observation folder or observation
- Copy/Paste a target, observation folder, or observation within your proposal or into a separate proposal.
- **Differences** – can difference two separate proposals, or on any part of the APT file (two parts of proposal info, two targets, two observations, etc.)

Important: to revise a label to provide clear tracking within your proposal.

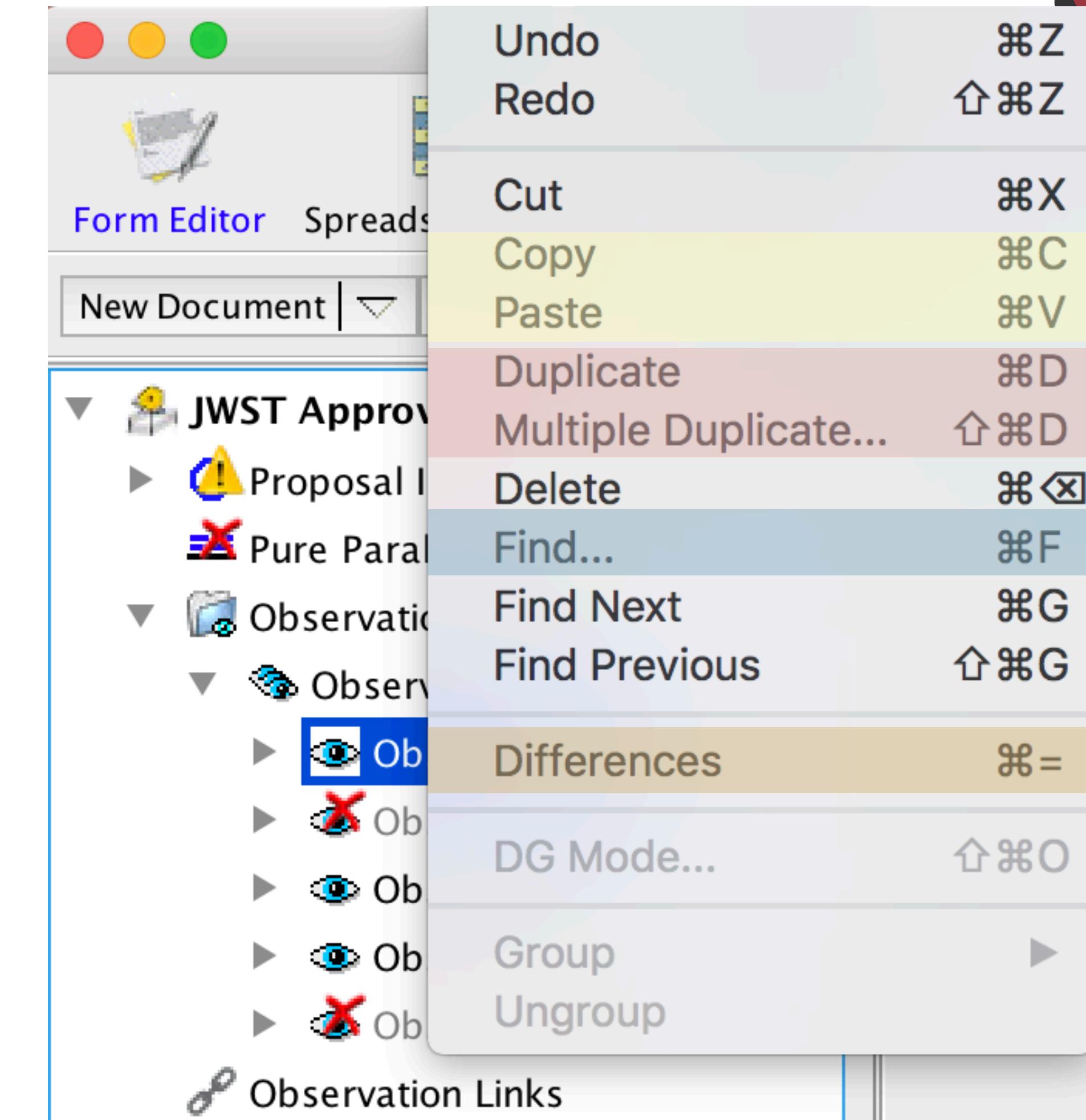


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APT Overheads and Smart Accounting

APT Overheads



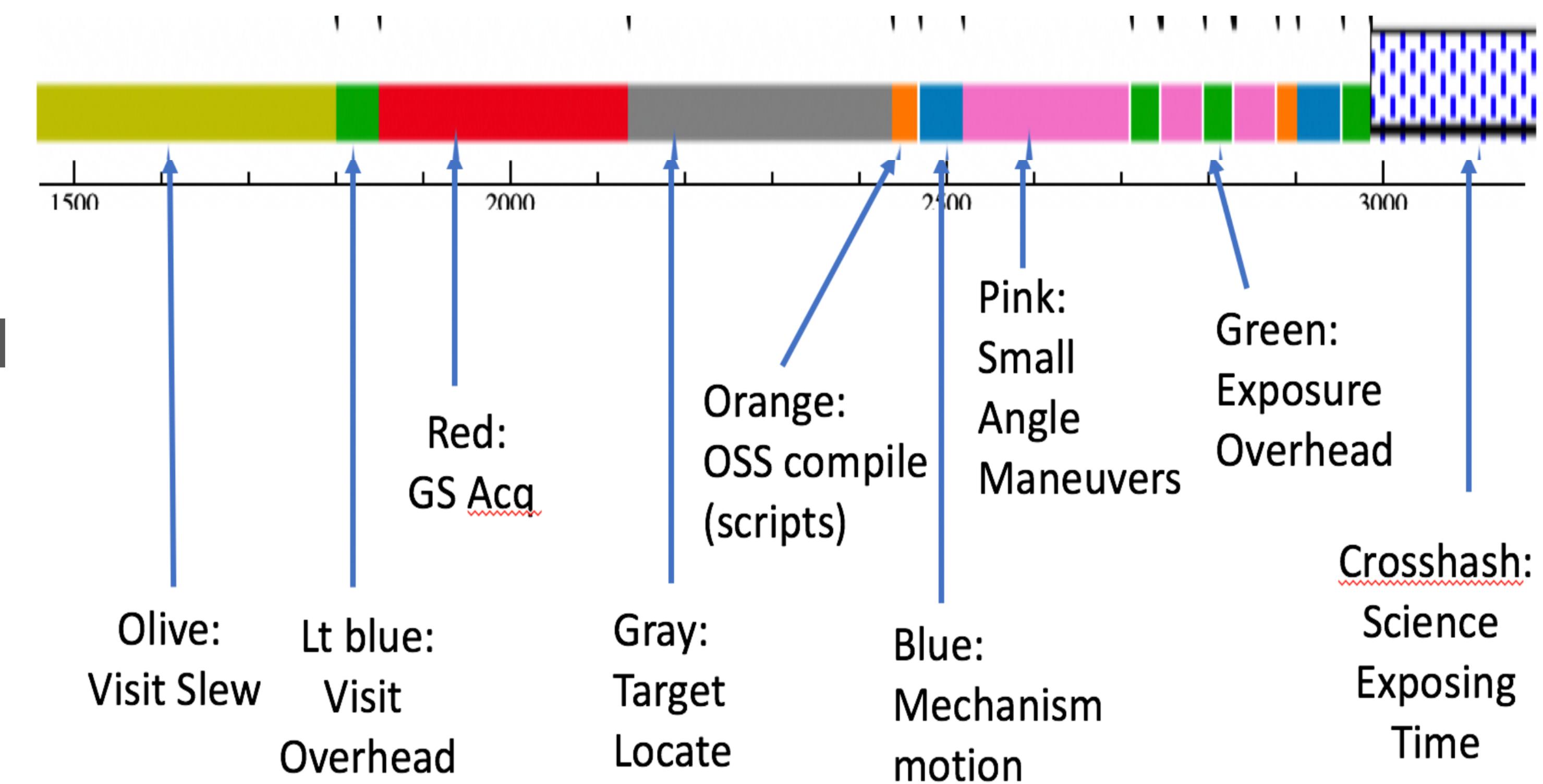
- JWST autonomous operations are complex.
 - There are many activities that need to occur to set up each observation. While most are fairly short, in the ensemble, the time can add up.
 - Slewing and settling take time, even for small motions.
- By policy, JWST amortizes the estimated time for calibrations and observatory and charges to each program.
 - Pre-launch estimate for this is 16%, which is included by APT.
- But to first order, overheads are what they are.
 - There is not too much you can do to lower your overhead charges by changing details in APT.
 - The Smart Accounting step in APT makes a reasonable attempt to lower artificially high overheads.

Our best advice to you is to concentrate on the science you want to do and don't be overly concerned about overheads!

APT Graphical Timeline



- Shows a summary of various overheads affecting the proposed observations.
- Provides you with insight into the major steps that occur and the times accounted to each.
- Is not meant to represent the actual detailed set of events that occur in the onboard execution of the observation.



Additional Resources:

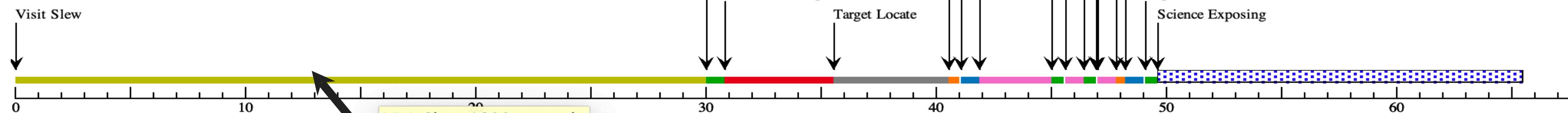
- [JDox Article: APT Graphical Timeline](#)
- [YouTube Video Tutorial: APT Graphical Timeline](#)

APT Graphical Timeline Examples

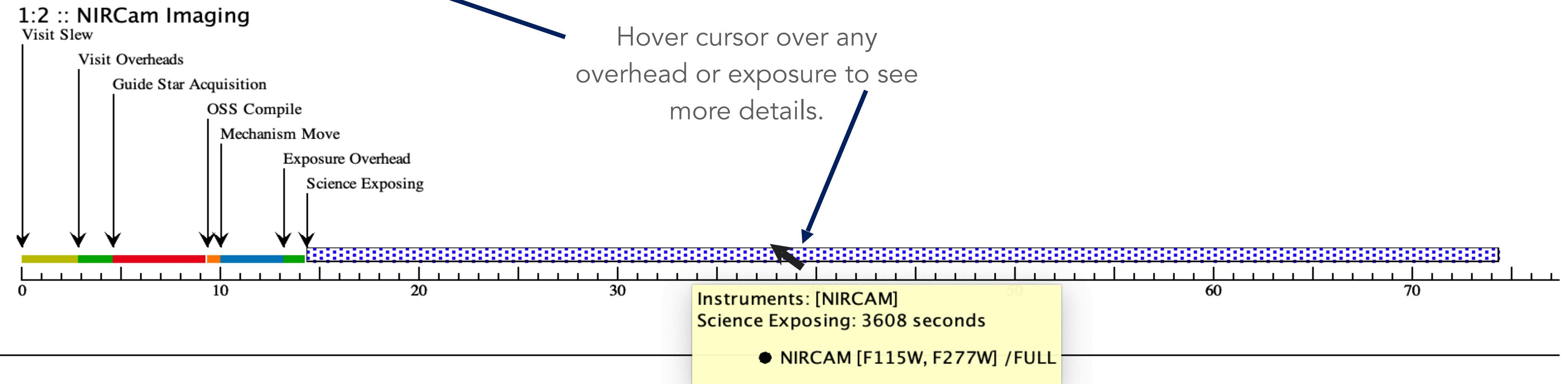


1:1 :: MIRI Coronagraphic Imaging

Initial visit,
relatively short
science
exposure;
overheads
dominate



A second visit,
relatively fewer
overheads, long
science exposure



APT Science Time and Total Charged Time



Science time and total charged time (including overheads) can be viewed in APT at the proposal level, the observation level, and visit level.

The screenshot illustrates the APT software interface across three levels of observation details:

- Proposal level:** On the left, the navigation tree shows "JWST Approved Proposal 2 (Unsaved)". A yellow callout box highlights the "Visit Duration (secs)" row in the Visit 3:1 panel, which shows values 1794, 1296, 1800, 783, 0, and 5673. The text "Total for proposal" is overlaid on the right side of this panel.
- Visit level:** In the center, the "Visit 3:1 of JWST Approved Proposal 2 (Unsaved)" panel is shown. It displays visit details like Number (3), Status (IMPLEMENTATION), Label (MIRI MRS), Instrument (MIRI), Template (MIRI Medium Resolution Spectroscopy), Target (1 ACO-2163), and splitting parameters (55.0 Arcsec, 1 visit). A yellow callout box highlights the "Duration (secs)" row, showing 1794 and 5673, along with Data Volume (546 MB).
- Observation level:** On the right, the "Proposal Information of JMIRI template examples" panel is shown. It includes fields for Proposal ID (2), Category (GO), Cycle (1), and various time and data volume metrics. A yellow callout box highlights the "Science Time (hours)" row, showing 1.37, along with Charged Time (hours) (4.06), Data Volume (MB) (3822.32), and Allocated Time (hours) (10.00).

APT Overhead Charge Corrections (Smart Accounting)



- While designing and building an observing program, overheads can become overestimated as observations are added individually.
 - Ex: NIRCam and MIRI imaging requested on the same source, will likely be scheduled back-to-back.
 - Ex: Many targets closely spaced on the sky, will likely be scheduled in close succession.
 - In both cases, initial assumptions of a large 1800 s slew to start each observation are likely a significant overestimate.
- Running Smart Accounting on your finished observations searches for and removes extra initial slews and other smaller inefficiencies that may have crept in.
 - Some programs will see a significant correction while others will not.

Note: While Smart Accounting may reduce your proposal's total time request (which is good for you!), this adjustment is important in a larger sense, to provide the best estimate of overall observatory resource usage expected. So...

Always run Smart Accounting before submitting your proposal!

Where to find and run Smart Accounting in APT



- Because of the importance of running Smart Accounting, APT provides several places where it can be invoked.

The screenshot shows the APT (Advanced Planning Tool) interface. The top menu bar includes: Form Editor, Spreadsheet Editor, Orbit Planner, Visit Planner, Timeline, View in Aladin, BOT, Target Confirmation, PDF Preview, Submission, Errors and Warnings, Run All Tools, Stop, New Document, New Co-I, What's New (NEW), Roadmap, and Feedback.

The left sidebar displays a tree view of the proposal structure:

- JWST Approved Proposal 6 (Mosaics_key.aptx)
 - Proposal Information
 - Proposal Description
 - Team Expertise
 - PI: Dr. William P. Blair
 - Targets
 - Fixed Targets
 - 1 M83
 - 2 M82
 - 3 NGC-891
 - 4 M-51
 - 5 M-51-INSERT
 - Observations
 - M83 4x2 NIRCam and 5x8 MIRI
 - M82 non-symmetric mosaic
 - NGC 891 example
 - Observation 4
 - Observation Folder
 - Observation 5 Mosaic Group
 - Observation 5
 - Observation Links

Where to find and run Smart Accounting in APT



- Because of the importance of running Smart Accounting, APT provides several places where it can be invoked.
- A button right on the Proposal Information page.

The screenshot shows the APT (Advanced Planning Tool) software interface. The top menu bar includes options like Form Editor, Spreadsheet Editor, Orbit Planner, Visit Planner, Timeline, View in Aladin, BOT, Target Confirmation, PDF Preview, Submission, Errors and Warnings, Run All Tools, and Stop. Below the menu is a toolbar with icons for New Document, New Co-I, What's New, Roadmap, and Feedback. The main window displays the 'Proposal Information' for 'JWST Approved Proposal 6 (Mosaics_key.aptx)'. The left sidebar lists proposal components: Proposal Information (selected), Proposal Description, Team Expertise, PI: Dr. William P. Blair; Targets (selected), Fixed Targets (1 M83, 2 M82, 3 NGC-891, 4 M-51, 5 M-51-INSERT); Observations (M83 4x2 NIRCam and 5x8 MIRI, M82 non-symmetric mosaic, NGC 891 example, Observation 4, Observation Folder, Observation 5 Mosaic Group, Observation 5); and Observation Links. The right panel shows detailed proposal information: Title (Mosaic Use Case Examples), Abstract (This program uses M83 and M82 as test cases for proposing simple mosaics. Obs 1: Simple NIRCam mosaic of M83. Obs 2: Simple MIRI mosaic of M83. Obs 3: Non-symmetrical Mosaic of M82 with NIRCam.), Proposal ID (6), STScI Edit Number (3), Category (GO), Calibration (unchecked), Treasury (unchecked), Pure Parallel Proposal (unchecked), Cycle (1), Explain unschedulable observations (checkbox), Science Time (hours) (4.14), Charged Time (hours) (48.75), Run Smart Accounting (button highlighted with a yellow box), Data Volume (MB) (57395.80), Allocated Time (hours) (50.00), and Proposal Size (MEDIUM). Navigation buttons at the bottom include Edit Previous, New, and Edit Proposal Description.

Where to find and run Smart Accounting in APT

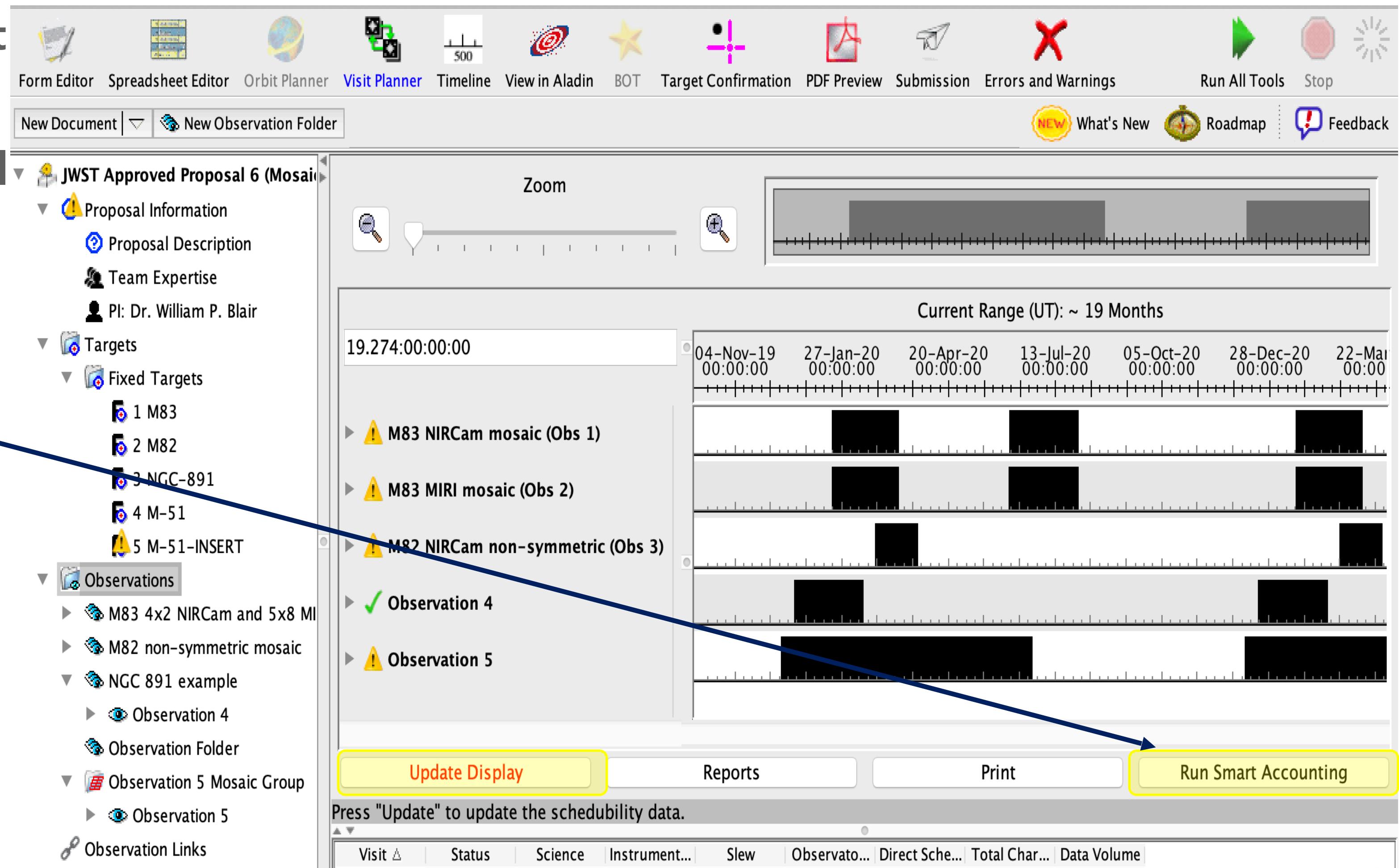


- Because of the importance of running Smart Accounting, APT provides several places where it can be invoked.

- A button right on the Proposal Information page.

- From within the Visit Planner

- By clicking the “Run Smart Accounting” button at lower right.



Where to find and run Smart Accounting in APT



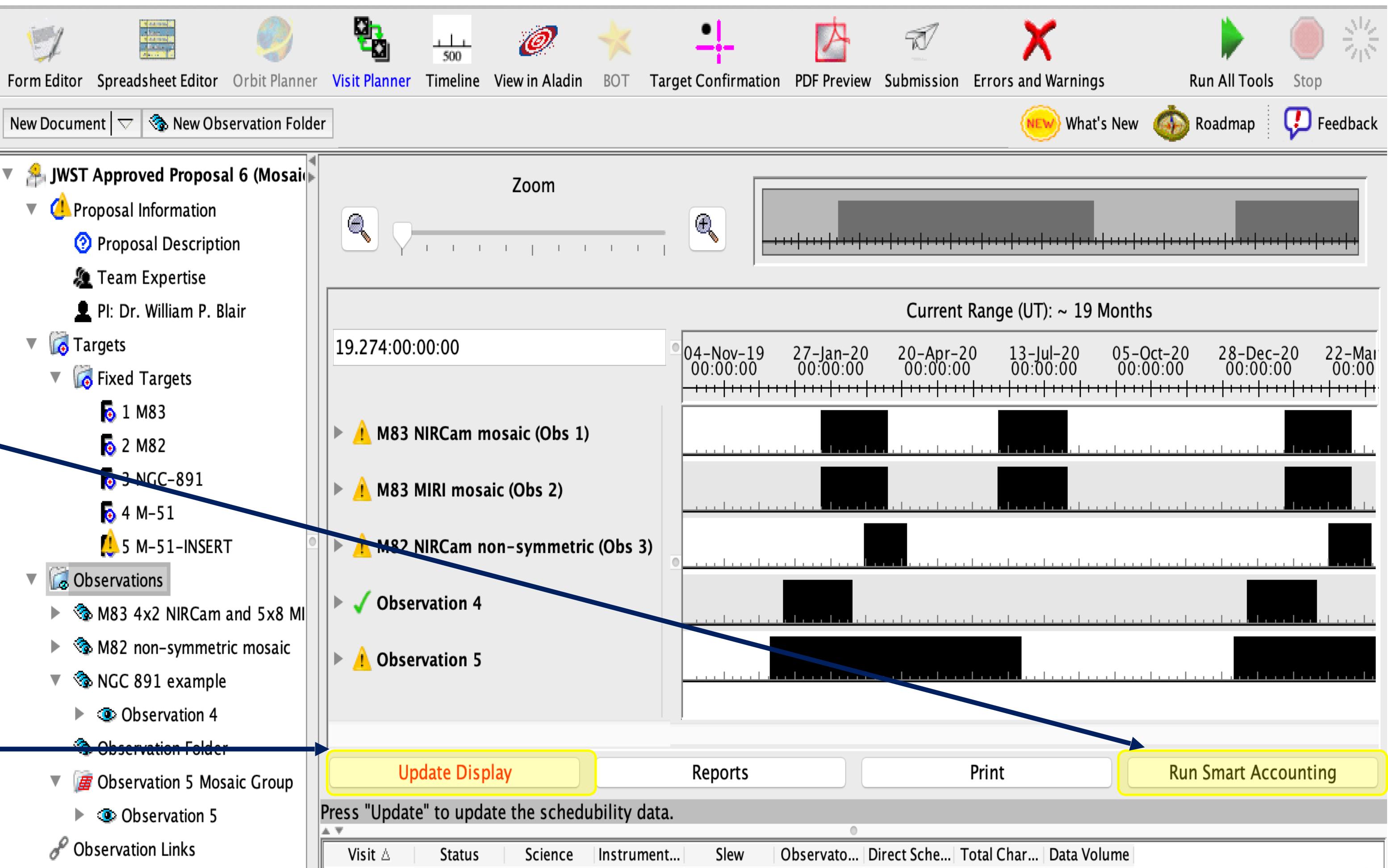
- Because of the importance of running Smart Accounting, APT provides several places where it can be invoked.

- A button right on the Proposal Information page.

- From within the Visit Planner

- By clicking the “Run Smart Accounting” button at lower right.

- Or simply by selecting your entire observation folder in the tree editor and running the “Update Display” button in the Visit Planner.



APT Smart Accounting Hint



To see the impact of Smart Accounting, note the total charged time on the Proposal Information page prior to executing the task. Then compare to the result when the task completes.

Before Smart
Accounting Run

Science Time (hours)	1.19
⚠️ Charged Time (hours)	13.86
Run Smart Accounting	

Note: This button only appears when APT thinks the accounting is out of date.

After Smart
Accounting Run

Science Time (hours)	1.19
Charged Time (hours)	11.62

Additional Resource: [JDox Article: APT Smart Accounting](#)

APT Science Time and Total Charged Time -- Summary



- Science time vs. Total Charged Time is just informational for the proposer.
 - Proposals with short exposures will be dominated by overheads.
 - Proposals with relatively long exposures will have more balance.
 - That's just the way it is for JWST observations. BUT...
 - The Time Allocation Committee (TAC) only sees the total resource request.

So don't obsess over the “efficiency” of your proposal. Just concentrate on proposing the best science you can!

Proposal Submission



- Prior to submitting a proposal, the following should be completed:
 - Run Smart Accounting
 - Run Visit Planner
 - Run Target Confirmation
 - Verify the Science Justification PDF is attached.
 - Review **Errors** and **Warnings**
 - You can hover over Errors or Warnings to see a description of the issue
 - Errors:** appear when required information is missing or if unsupported values have been selected or entered into a field
 - Warnings:** may or may not be a real problem, depending on the context, so you need to check.

The screenshot shows the JWST Mission Control software interface. At the top, there is a toolbar with various icons: Orbit Planner, Visit Planner, Timeline, View in Aladin, BOT, Target Confirmation, PDF Preview, Submission (which is highlighted in blue), Errors and Warnings, Stop, What's New, Roadmap, and Feedback. Below the toolbar, a main window titled "Submit Draft Proposal To STScI" is displayed. Inside this window, the "Proposal:" field contains "JWST Draft Proposal". The "Submission Comments:" field contains "This is a first submission." Below these fields, a message states "This Draft proposal has not been submitted." At the bottom of the window, there are three buttons: "Submit Proposal", "Resubmit Proposal", and "Clear ID#". A link "How Do I Resubmit?" is also present. On the left side of the main window, there is a "Submission Log" section which is currently empty.

Proposal Submission



- Prior to submitting a proposal, the following should be completed:
 - Run Smart Accounting
 - Run Visit Planner
 - Run Target Confirmation
 - Verify the Science Justification PDF is attached.
 - Review **Errors** and **Warnings**
 - You can hover over Errors or Warnings to see a description of the issue
 - Errors:** appear when required information is missing or if unsupported values have been selected or entered into a field
 - Warnings:** may or may not be a real problem, depending on the context, so you need to check.
- Submit!**

Orbit Planner Visit Planner Timeline View in Aladin BOT Target Confirmation PDF Preview **Submission** Errors and Warnings Is Stop NEW What's New Roadmap Feedback

Submit Draft Proposal To STScI

Proposal: JWST Draft Proposal

This is a first submission.

Submission Comments:

This Draft proposal has not been submitted.

Submit Proposal Resubmit Proposal Clear ID#

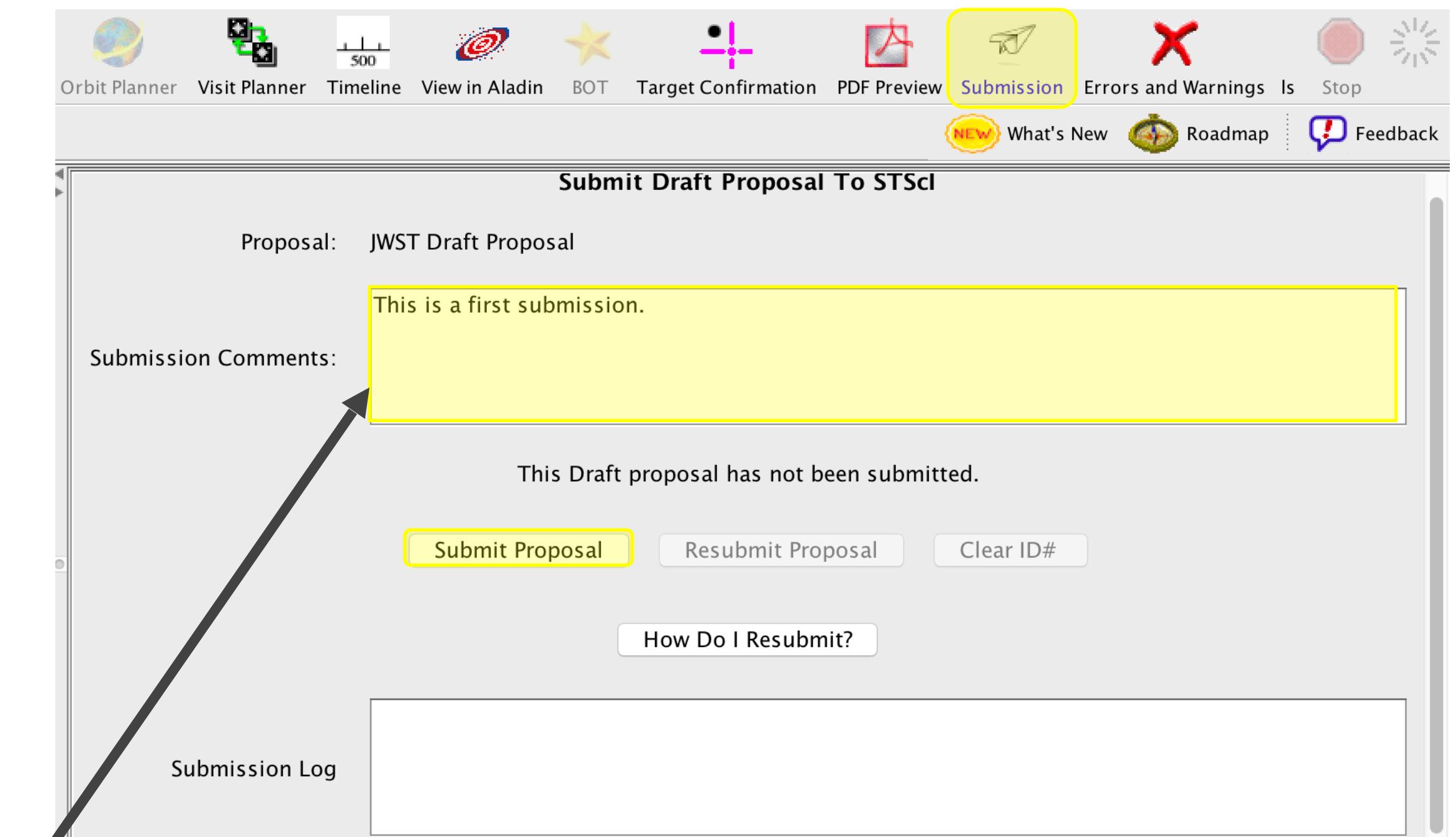
How Do I Resubmit?

Submission Log

Proposal Submission



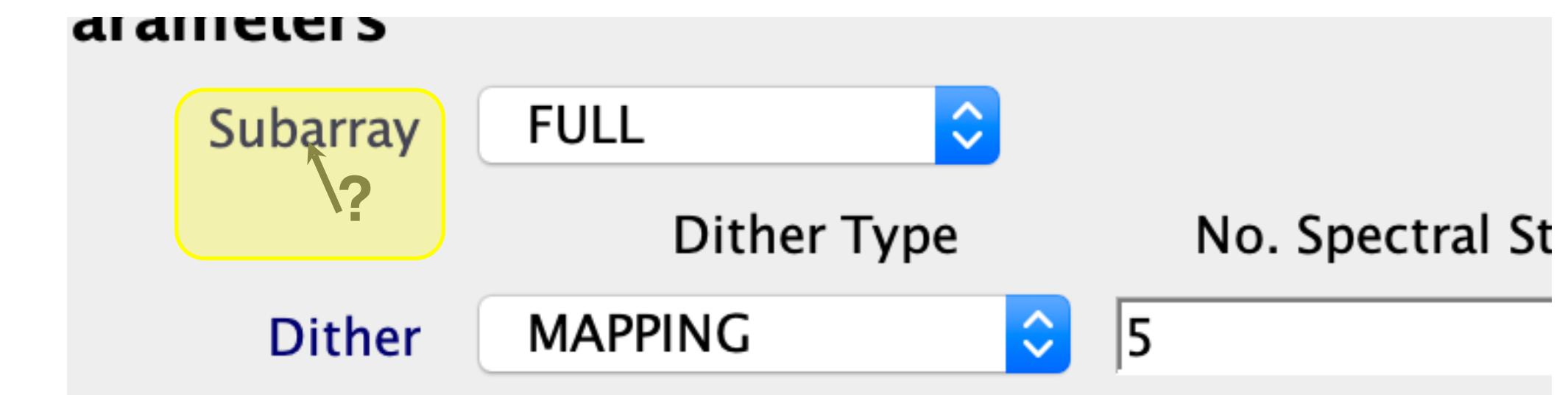
- Prior to submitting a proposal, the following should be completed:
 - Run Smart Accounting
 - Run Visit Planner
 - Run Target Confirmation
 - Verify the Science Justification PDF is attached.
 - Review Errors and Warnings
 - You can hover over Errors or Warnings to see a description of the issue
 - Errors:** appear when required information is missing or if unsupported values have been selected or entered into a field
 - Warnings:** may or may not be a real problem, depending on the context, so you need to check.
- Submit!**
 - You cannot submit with Errors, but can submit with Warnings. Any diagnostics should be commented on.



Additional Resources for Help with APT



- JWST User Documentation Website <https://jwst-docs.stsci.edu/>, including
 - [The JWST Astronomer's Proposal Tool Overview](#) (and links therein)
 - [Help with Individual APT Templates](#)
 - [Example Science Programs](#), each of which has a specific APT step-by-step guide.
- YouTube Tutorial Videos <https://www.youtube.com/jwstobserver>, and in particular, the [Playlist of APT-specific Videos](#)
- Context Sensitive Help within APT
 - Clicking on Blue headings within APT opens a browser and points to relevant JDox support information.



Thanks for Listening – Questions?



Astronomer's Proposal Tools Version 2020.1.1 Beta (Mon Jan 13 2020) JWST PRD: PRDOPSSOC-M-026

Form Editor Spreadsheet Editor MSA Planning Tool Orbit Planner Visit Planner Timeline View in Aladin BOT Target Confirmation PDF Preview Submission Errors and Warnings Run All Tools Stop

New Document NEW What's New Roadmap Feedback

New HST Proposal
New JWST Proposal

Form Editor

Form Editor

Edit Previous ↪ New ↴ ↪ Edit Next

Show: ↴ ↵

No errors & warnings (Click for Details)

A screenshot of the "Form Editor" window from the Astronomer's Proposal Tools. The window title bar reads "Astronomer's Proposal Tools Version 2020.1.1 Beta (Mon Jan 13 2020) JWST PRD: PRDOPSSOC-M-026". The menu bar includes "Form Editor", "Spreadsheet Editor", "MSA Planning Tool", "Orbit Planner", "Visit Planner", "Timeline", "View in Aladin", "BOT", "Target Confirmation", "PDF Preview", "Submission", "Errors and Warnings", "Run All Tools", and "Stop". Below the menu is a toolbar with icons for each tool. A sub-menu for "New Document" is open, showing "New HST Proposal" and "New JWST Proposal". The main workspace is titled "Form Editor" and contains a large grid of repeating world map icons. At the bottom are buttons for "Edit Previous", "New", and "Edit Next", and a "Show:" dropdown. A status bar at the bottom right indicates "No errors & warnings (Click for Details)".



MSA Planning Tool (MPT)

A guide to JWST MOS terminology

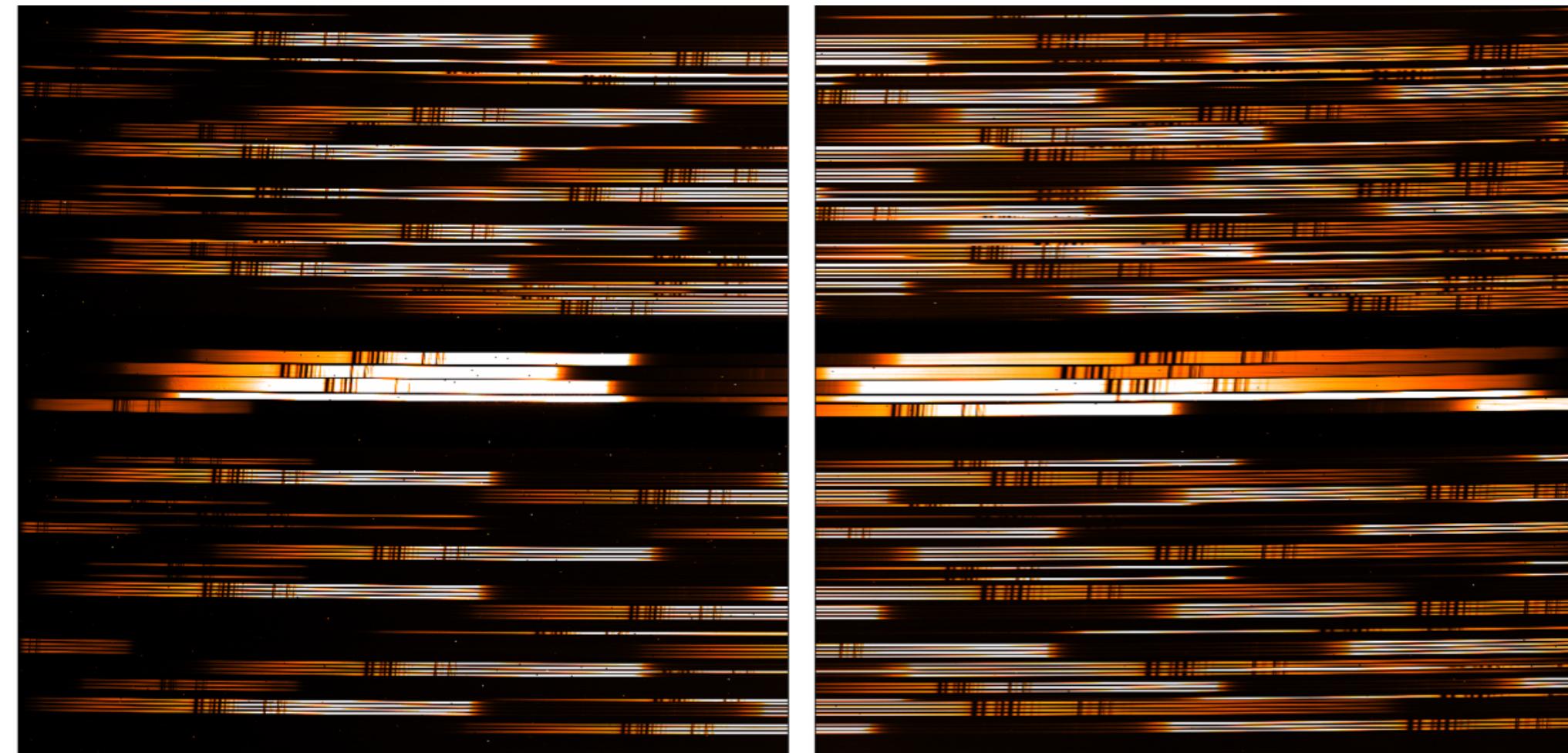


- **MOS** - Multi-Object Spectroscopy
 - ▶ the NIRSpec mode for obtaining spectra of 10-100s of specific targets simultaneously
- **MSA** - Micro-Shutter Assembly
 - ▶ the array of very small shutters (0.2x0.46 arcsec) within NIRSpec that allows specific targets to be selected and contaminants to be blocked
- **MPT** - MSA Planning Tool
 - ▶ the tool within APT for planning and optimising the MOS observations with the NIRSpec MSA



Why use MPT?

- NIRSpec MOS can obtain spectra for 10s-100s of objects simultaneously
- Targets are selected by opening a few of a grid of 250,000 micro-shutters
- MPT optimises this “MOS mask” given your target catalogue



Example (flat-field test exposure)
of 100 tightly-packed spectra
(G395H grating)

- ▶ details on the MSA shutter array are in the “observing modes” session
- ▶ strategies are covered in the MOS hands-on session

MSA Planning Tool (MPT) in APT



A screenshot of the Astronomer's Proposal Tools (APT) software interface. The title bar reads "Astronomer's Proposal Tools Version 27.3 mpt-demo (Thu Jul 25 2019) JWST PRD: PRDOPSSOC-L-023". The menu bar includes "Form Editor", "Spreadsheet Editor", "MSA Planning Tool" (which is highlighted with a yellow hexagon), "Orbit Planner", "Visit Planner", "Timeline", "View in Aladin", "BOT", "Target Confirmation", "PDF Preview", "Submission", "Errors and Warnings", "New Document", "What's New", "Roadmap", and "Feedback". The main window displays the title "Astronomer's Proposal Tools" and the version information "Version 27.3 mpt-demo (Thu Jul 25 2019) JWST PRD: PRDOPSSOC-L-023". Below this, there is a list of copyright and usage notices:

- Copyright 2002 – 2007 United States Government as represented by the Administrator of the National Aeronautics and Space Administration. All Rights Reserved.
- This software has made use of the Aladin Sky Atlas (<http://aladin.u-strasbg.fr/>) developed at the *Centre de Données astronomiques de Strasbourg* (CDS – <http://cdsweb.u-strasbg.fr/>)
- This software has made use of the SIMBAD database, operated at CDS, Strasbourg, France.
- This software has made use of the NASA/IPAC Extragalactic Database (NED) which is operated by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.
- This software uses portions of the JSky library which is maintained by the European Southern Observatory.

What is needed to run MPT?



- An internet connection
 - ▶ access to the most up-to-date MSA shutter operability
 - ▶ checking for guide stars during planning
- A complete and accurate astrometric catalogue
 - ▶ accurate source positions (<15mas relative accuracy)... may require NIRCam pre-imaging
- MPT produces:
 - ▶ **plans** with 1 or more **pointings**
 - ▶ **MSA configurations**
 - ▶ target sets
- One or multiple **plans** can be selected for a given **observation**



The catalogue

- First step to create a MOS observation... upload complete catalogue of sources to the MPT
- Catalogue should include all known sources in the field, to properly identify contaminants

- Upload source catalogue as an ASCII file
- It **must** contains J2000 **RA** and **Dec** expressed in degrees or hexadecimal
- It **cannot** have duplicate **IDs** or NULL entries
- Optional: Fluxes or magnitudes for the sources helps
 - ▶ Magnitudes are needed to properly define reference stars
- Optional: Target priorities are recommended
- The file can have a header, marked by “#”
- Remember: the relative astrometric accuracy of the catalogue must be between 5 and 50 mas

#	ID	RA	DEC	MAG	F160W MAG	RR_F160W	FWHM	STELLARITY
514	53.17530756	-27.81989068	22.46	0.039	2.9	0.91		
2639	53.17797177	-27.80327718	99	29.183	3.48	0.81		
7894	53.16615975	-27.76428237	29.284	0.202	6.95	0.81		
3352	53.15236091	-27.79958882	29.388	0.275	6.6	0.74		
10101	53.18123196	-27.78147671	28.977	0.323	5.29	0.74		
4166	53.16562375	-27.79587255	28.733	0.136	9.86	0.73		
6093	53.15093966	-27.79386221	30.681	0.576	3.26	0.73		
7740	53.16000591	-27.76349436	29.364	0.218	8.99	0.73		
9976	53.14403028	-27.78036021	29.263	0.206	7.82	0.73		
3740	53.16054039	-27.79774121	29.213	0.228	6.21	0.71		
10586	53.1390074	-27.78953776	29.582	0.268	9.7	0.71		
615	53.15839939	-27.81899646	24.087	0.06	2.84	0.7		
8694	53.170444959	-27.77458204	29.424	0.38	5.34	0.7		
2032	53.14225186	-27.80676448	29.2	0.636	9.56	0.69		
6456	53.16153898	-27.78625609	29.181	0.189	10.11	0.69		
7919	53.16679656	-27.76437467	29.013	0.289	7.18	0.68		
4567	53.12870239	-27.78690427	99	28.452	4.67	0.67		
7988	53.16384488	-27.76478608	28.148	0.277	4.5	0.66		
5914	53.16015634	-27.79318966	29.424	0.25	8.94	0.64		
20309	53.16691677	-27.81874945	27.564	0.118	3.41	0.63		
8737	53.15973205	-27.76936156	29.291	0.218	3.08	0.62		
7566	53.18247561	-27.78085107	29.067	0.21	6.28	0.58		
9681	53.18741752	-27.77796957	29.419	0.289	3.24	0.55		

Load the catalogue as an MSA Source Catalogue Target



From the
Form Editor

The screenshot shows the 'Astronomer's Proposal Tools Version 27.3 mpt-demo (Thu Jul 25 2019) JWST PRD: PRDOPSSOC-L-023 - JWST Draft Proposal (Unsaved)' window. A yellow hexagon highlights the 'Form Editor' tab in the top menu bar. The left sidebar shows a tree view of the proposal structure, with 'Targets' selected. The main panel displays the 'Targets' section with several options:

- Fixed Target Resolver: Resolve a target name or position
- New Fixed Target: Create a new Fixed Target
- New Target Group: Create a new Target Group
- New Solar System Target: Create a new Solar System Target
- New Generic Target: Create a new Generic Target
- Import MSA Source Catalog...**: Import a source catalog to use in MSA Planning (this option is highlighted with a red box)
- Import Targets...: Import Fixed Targets from whitespace, CSV, TSV, or VOTable

At the bottom, there are buttons for 'Edit Unnamed Col', 'New', and 'Edit Observations', along with a message indicating '9 errors & warnings (Click for Details)'.

Catalogue importer



- **Column for Flux** can be used for filtering sources when creating candidate sets
- **Weight** can be used to prioritise targets

Source Importer: file:/Users/sabbi/Desktop/Prove%20MPT/Rafel_2015_HUDF_small_ALLref.txt

Catalog Name is a required field.

File Format: Whitespace Separated

File to Import: bbi/Desktop/Prove%20MPT/Rafel_2015_HUDF_small_ALLref.txt | Browse...

Here is some of the content of the selected file:

ID	RA	DEC	MAG_F160W	MAGERR_F160W	FWHM	STELLARITY	ELLIPTICITY	THETA	Z_BPZ	ZMIN_BPZ	ZMAX_BPZ	ODDS_BPZ	CHISQ2_BPZ	STAR	WEIGHT	NRS_F110W	NRS_F140X	NRS_CLEAR	REFERENCE
514	53.17530756	-27.81989068	22.46	0.039	2.9	0.91	0.103	47.1	5.581	5.3	5.85	0.996	6.324	1	300	22.741	-99	22.46	TRUE
2639	53.17797177	-27.80327718	99	29.183	3.48	0.81	0.022	82.7	5.66	0.78	6.07	0.794	0.953	0	300	29.631	-99	99	TRUE
7894	53.16615975	-27.76428237	29.284	0.202	6.95	0.81	0.203	-50.6	6.45	5.75	6.98	0.887	1.047	0	300	29.126	28.984	29.284	TRUE
2252	53.16526601	-27.76650002	29.280	0.275	6.6	0.74	0.212	76.0	6.50	6.25	6.50	0.805	0.805	0	300	29.526	29.27	29.280	TRUE

ID RA DEC Ignore Col| Ignore Column FWHM Stellarity Ignore Col| Weight Magnitude Magnitude Magnitude Reference

Columns selected below will be used as flux parameters of the sources for contamination calculations.
All other columns can be used for filtering only.

Column for Flux: None Selected

Column for Flux Uncertainty: None Selected

Flux Units:

Cancel Import

MSA Source Catalogue Target



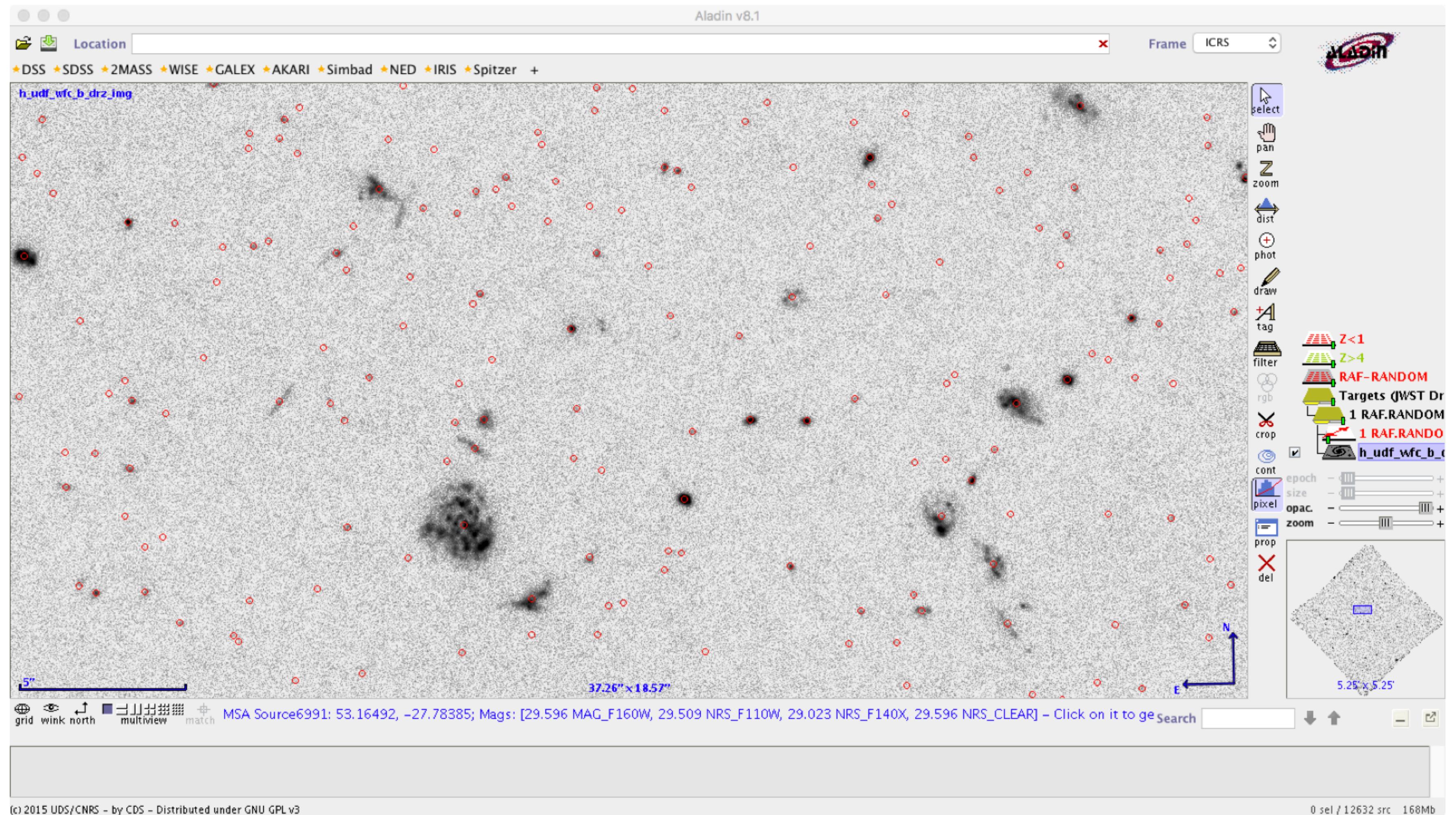
MSA Catalog is now
in the Targets Folder

Can create multiple
candidate sets from
a single catalogue

Visualisation of the
catalogue via Aladin

The screenshot shows the "Astronomer's Proposal Tools Version 2020.1 mpt-demo (Thu Oct 24 2019) - JWST Draft Proposal (RAFEL-2015.aptx)" window. The left sidebar shows a tree view of the proposal structure, including "JWST Draft Proposal (RAFEL-2015)", "Proposal Information", "Targets" (selected), "MSA Catalogs" (containing "1 RAFEL-2015"), and "Observations". The main panel displays the "1 RAFEL-2015 of JWST Draft Proposal (RAFEL-2015.aptx)" details. It includes fields for "Number" (1), "Name in the Proposal" (RAFEL-2015), and "Name for the Archive" (RAFEL-2015). Below these are tabs for "Candidate Sets" and "Comments". A section for "Astrometric Accuracy (mas)" is set to 10.0. The "Reference Position" is RA: 03 32 38.9682 and Dec: -27 47 26.86. A "Pre-Image Availability" dropdown is set to "Not required". A large table below lists 9969 sources, showing columns for ID, RA, DEC, Size, Redshift, Reference, Stellarity, MAG_F160W, NRS_F110W, NRS_F140X, NRS_CLEAR, and W. The table includes rows for various source identifiers like 23796, 54454, etc. At the bottom of the main panel are buttons for "Edit MSA Catalogs", "New", "Edit Observations", and a warning about 12 errors & warnings.

Catalogue sources displayed in Aladin



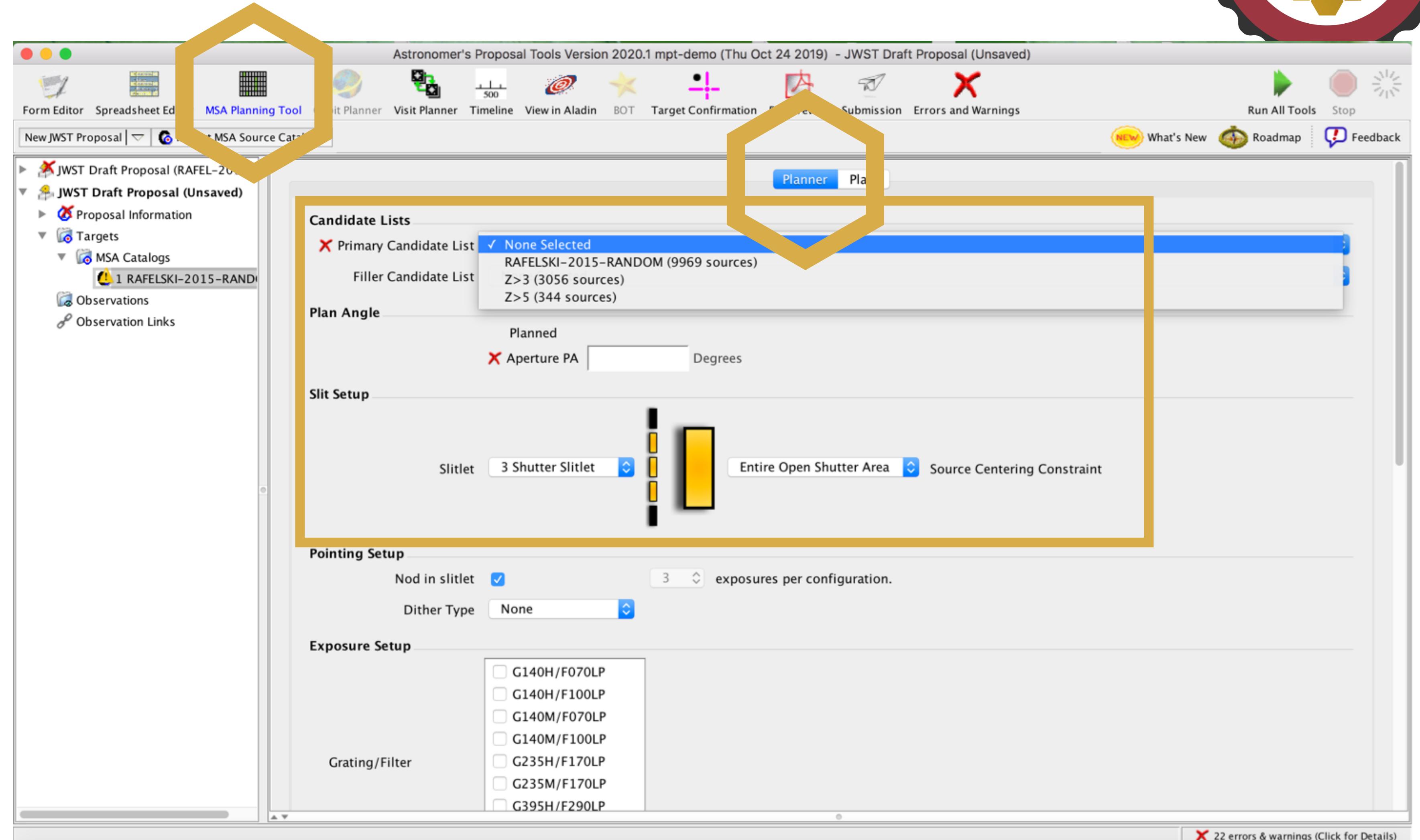
The MSA Planning Tool



MSA Planning Tool in the APT toolbar

The **Planner** tab is where you design MOS plans

- Select candidate lists from your MSA Catalog
- **Aperture PA** (position angle) is either a placeholder, or assigned to you by STScI (after acceptance)
- **Slitlet configuration and Centering Constraint** should be chosen



The MSA Planning Tool



The Planner is where you decide how to **dither**

- **Nodding** moves the sources within the slitlet – no shutter reconfiguration
- **Fixed Dither** moves the sources by a finite number of shutters specified by the user along the dispersion and/or the cross-dispersion direction.

Grating/Filter combination(s) must be selected to prevent spectral overlap in the chosen configurations

The screenshot shows the "Planner" tab of the JWST Astronomer's Proposal Tools. The interface includes a navigation bar with links like Form Editor, Spreadsheet Editor, MSA Planning Tool, Orbit Planner, Visit Planner, Timeline, View in Aladin, BOT, Target Confirmation, PDF Preview, Submission, Errors and Warnings, Run All Tools, Stop, What's New, Roadmap, and Feedback. On the left, a sidebar displays the "JWST Draft Proposal (RAFEL-2015)" structure with sections for Proposal Information, Targets, MSA Catalogs, Observations, Observation Folder, Observation Links, and JWST Draft Proposal (Unsaved). The main area contains several configuration panels: "Candidate Lists" (Primary Candidate List: Z>5 (344 sources), Filler Candidate List: RAFEL-2015 (9969 sources)), "Plan Angle" (Planned, Aperture PA: 135.0 Degrees), "Slit Setup" (Slitlet: 3 Shutter Slitlet, Entire Open Shutter Area, Source Centering Constraint), "Pointing Setup" (Nod in slitlet checked, 3 exposures per configuration, Dither Type: None), and "Exposure Setup" (Grating/Filter list: G140H/F070LP, G140H/F100LP, G140M/F070LP, G140M/F100LP, G235H/F170LP, G235M/F170LP, G395H/F290LP, G395M/F290LP, PRISM/CLEAR, checked). A search grid at the bottom allows setting search area dimensions (Center RA: 03 32 39.6524, Dec: -27 47 26.91) and shows results for "RAFEL_2015_HUDF_SMALL_ALLREF_RANDOM (9969 sources)". A status bar at the bottom right indicates 22 errors & warnings.



Examine and visualise a plan

The **Plans** tab is where you examine and visualise MOS plans

- MSA shutter view
- Collapsed shutter view
- Send to Aladin (on-sky visualisation)

The screenshot shows the 'Plans' tab of the APT software. The interface includes a toolbar with various icons for Form Editor, Spreadsheet Editor, MSA Planning Tool, Orbit Planner, Visit Planner, Timeline, View in Aladin, BOT, Target Confirmation, PDF Preview, Mission, Errors and Warnings, Run All Tools, Stop, What's New, Roadmap, and Feedback.

The left sidebar shows a tree structure of the draft proposal, including 'Proposal Information', 'Targets', 'MSA Catalogs', 'Observations', 'Observation Folder', 'Observation Links', and 'JWST Draft Proposal (Unsaved)'.

The main area has three tabs: 'Planner' (selected) and 'Plans'. The 'Planner' tab contains a 'Plan Selection' table:

#	Plan	# Configs	# Exposures	Primary Sources	Secondary Sources	Export
1	G140M-step10-cat	1	3	63	0	Export
2	G140M-step10-z5-filters	1	3	35	27	Export
3	PRISM-step10-z5-filters	1	3	56	55	Export

The 'Plans' tab contains a 'Pointings' table:

#	Plan number	Name	RA	Dec	RA (HMS)	Dec (DMS)	APA	Grating...	Target set size	Total weight	Show	Send to Aladin	Export
1	3	cleln1	53.1696588	-27.7888441	03 32 40.71...	-27 47 19.8...	134.996614...	PRISM/...	123	14187	Show	Send	Export
2	3	cleln2	53.1695414	-27.7887403	03 32 40.68...	-27 47 19.4...	134.996668...	PRISM/...	117	14106	Show	Send	Export
3	3	cleln3	53.1697762	-27.7889480	03 32 40.74...	-27 47 20.2...	134.996559...	PRISM/...	119	14148	Show	Send	Export

The 'Targets' section shows a table of targets:

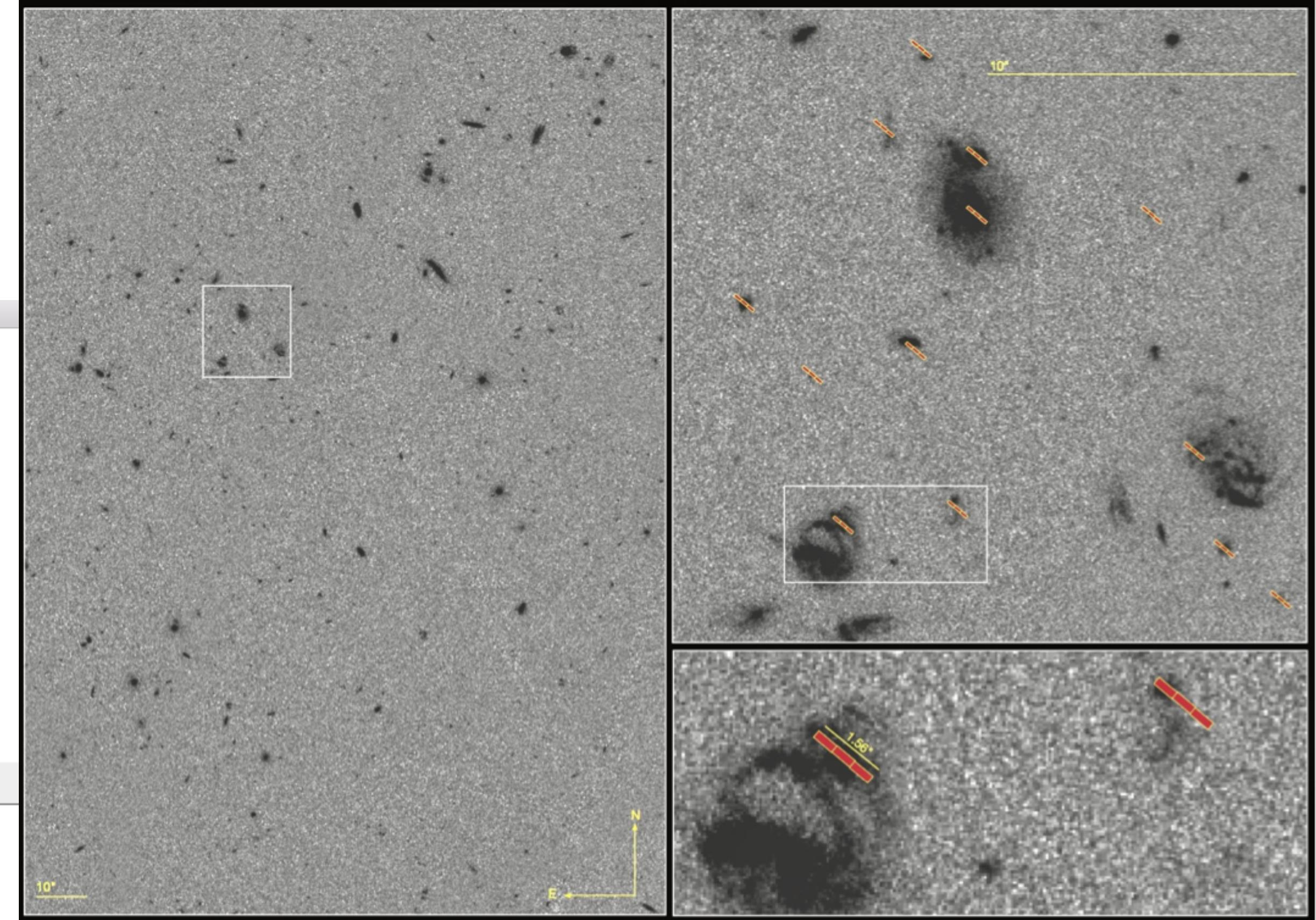
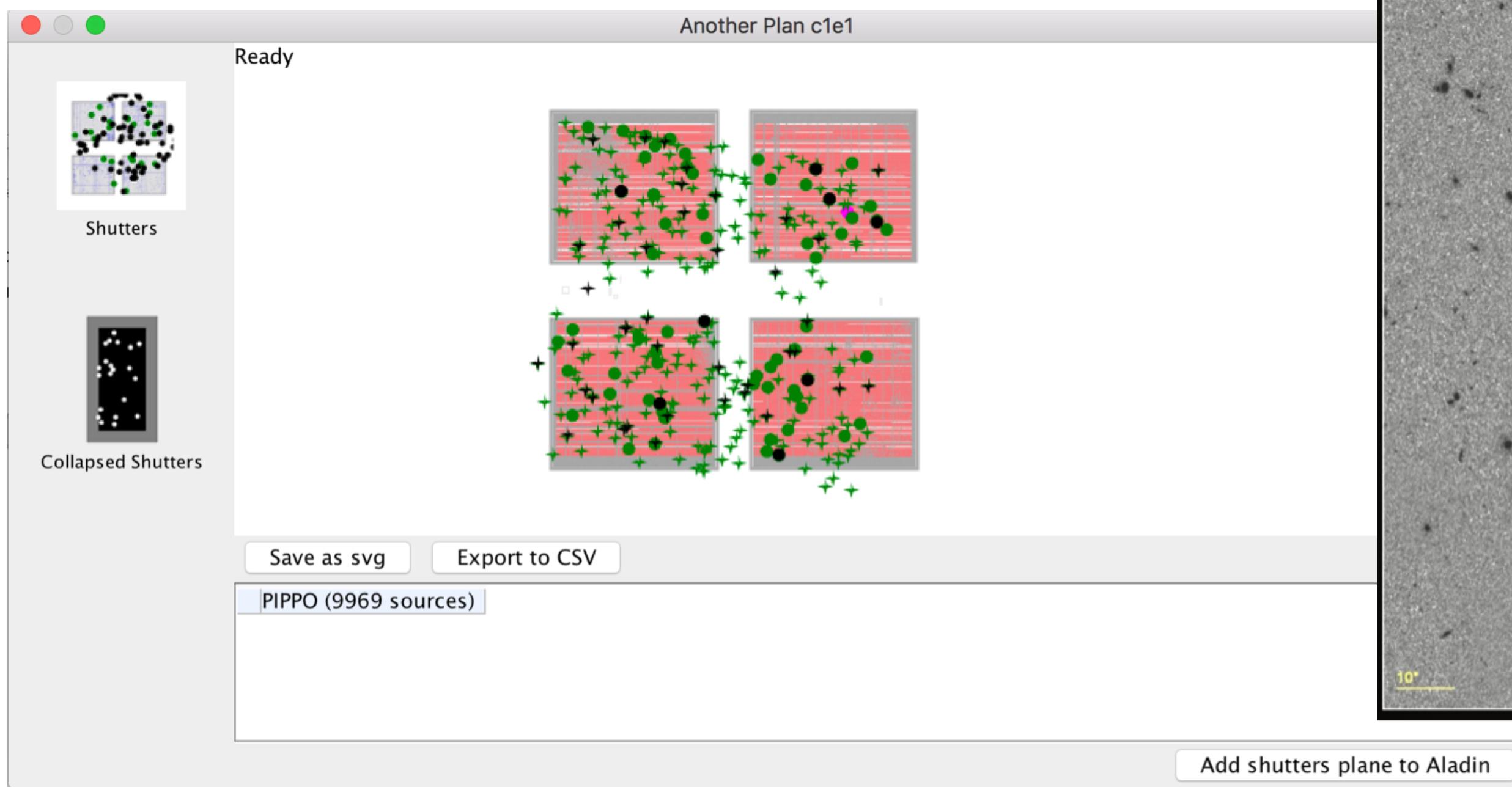
ID	Weight	Exposures	cleln1	cleln2	cleln3
8030	300	3	x	x	x
4449	30	3	x	x	x
9768	300	3	x	x	x
9098	300	3	x	x	x
9104	300	3	x	x	x
8950	300	3	x	x	x
10492	30	3	x	x	x
7878	300	3	x	x	x
8346	30	3	x	x	x
2784	300	3	x	x	x
6542	300	3	x	x	x
1416	300	2	v	v	v

Examine and visualise a plan



Shutters projected onto the sky in Aladin

Targets on the MSA



Create an observation



From the **Plans** tab

- Highlight a plan or plans
- Select the pointings
- Create Observation

The screenshot shows the 'Plans' tab in the APT software. The left sidebar shows a tree view of the proposal structure, including 'JWST Draft Proposal (RAFEL-201)', 'Targets', 'Observations', and 'JWST Draft Proposal (Unsaved)'. The main area has three tabs: 'Planner' (selected), 'Plans', and 'Visits'. The 'Plans' tab displays two tables: 'Plan Selection' and 'Pointings'. The 'Plan Selection' table lists three plans: G140M-step10-cat, G140M-step10-z5-filters, and PRISM-step10-z5-filters, with columns for Plan, # Configs, # Exposures, Primary Sources, Secondary Sources, and Export options. The 'Pointings' table lists three pointing entries: cleln1, cleln2, and cleln3, with columns for Plan number, Name, Dec, RA (HMS), Dec (DMS), APA, Grating..., Target set size, Total weight, Show, Send to Aladin, and Export Config. Below these tables is a 'Targets' section with a table showing target IDs, weights, exposures, and selection status for the three pointings. The bottom of the screen shows a status bar with 'RAFEL_2015_HUDF_SMALL_ALLREF_RANDOM (996...)' and 'Show: RAFEL_2015_HUDF_SMALL_ALLREF_RANDOM (9969 sources)'. A red error icon in the bottom right corner indicates 22 errors & warnings.

Proposing for MOS



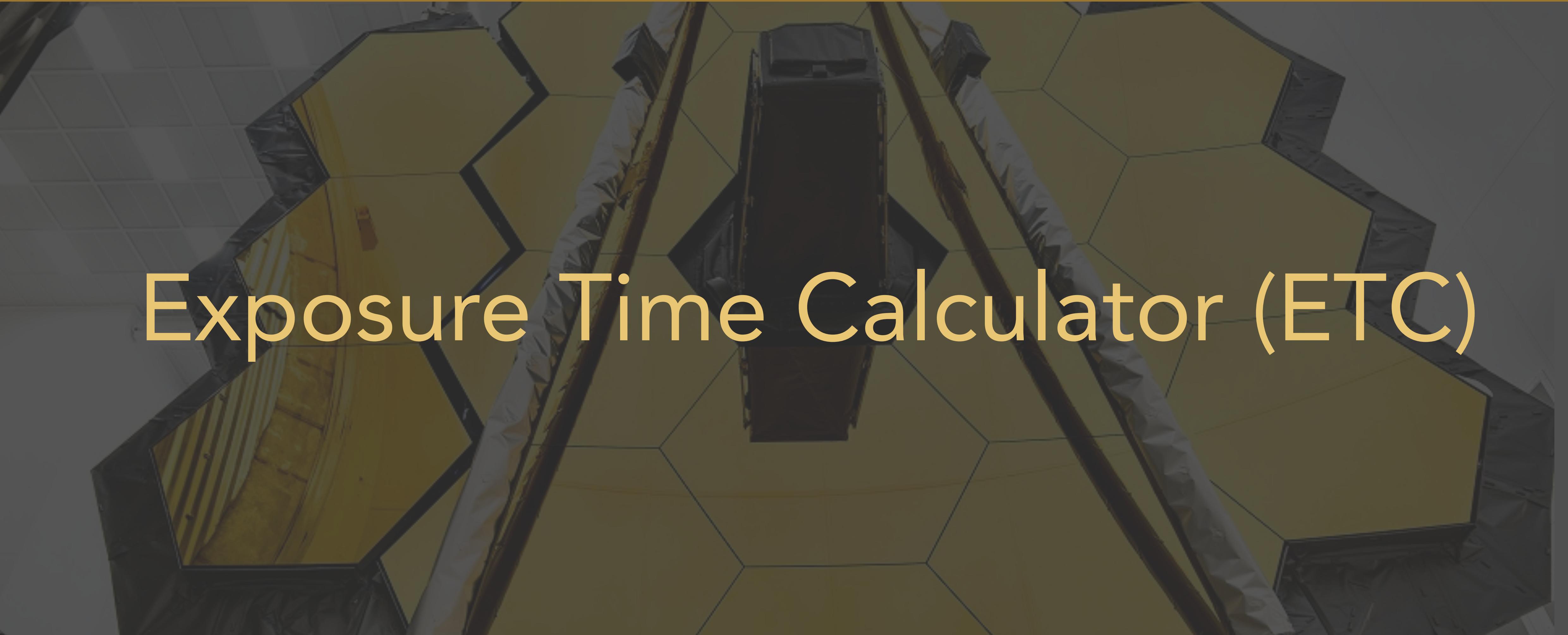
- Remember: need a catalogue with accurate relative astrometry
 - ▶ <15mas relative accuracy
- MOS will have a multi-step planning process
 - ▶ Final plans not possible until the program is accepted and scheduled (giving the actual Aperture PA)
 - ▶ A particular APA can be requested in a proposal, but must be strongly justified
- Instrument overheads are not negligible - use APT/MPT for the estimate

Additional helpful hints



- **Dither!!!** ...to improve background subtraction, wavelength coverage, etc
- Order your input catalogue by weight... during optimisation, MPT adds sources in the catalogue order
- Use a **Filler Set** to maximise efficiency/multiplexing
- Include **Primary** candidates in the **Filler** list to obtain additional observations of important sources
- Weight only matters for **Primary** sources (not for **Fillers**)
- If observability window is large, test optimisation for several APAs... if multiplexing differs significantly, consider including an **Orient Special Requirement**, with a minimum range of 30 deg
- If using a high-res grating (GxxxH), attempt to place most sources on the leftmost quadrants (MPT orientation) to avoid detector cutoffs
- Use Aladin to show the position of NIRCam parallels during NIRSpec exposures
- Input catalogue should be as complete as possible to check for contaminants in commanded open (or known **Failed Open**) shutters
- The MSA Configuration Editor can be used to amend MPT-optimised configurations. It can be found at the **observation level** in APT

Exposure Time Calculator (ETC)



Where is ETC?



jwst.etc.stsci.edu

Welcome to the JWST Exposure Time Calculator

[Quick Start](#)

[Create User](#)

[Login](#)

[Work Anonymously](#)

News

Welcome to version 1.5 of the JWST ETC!

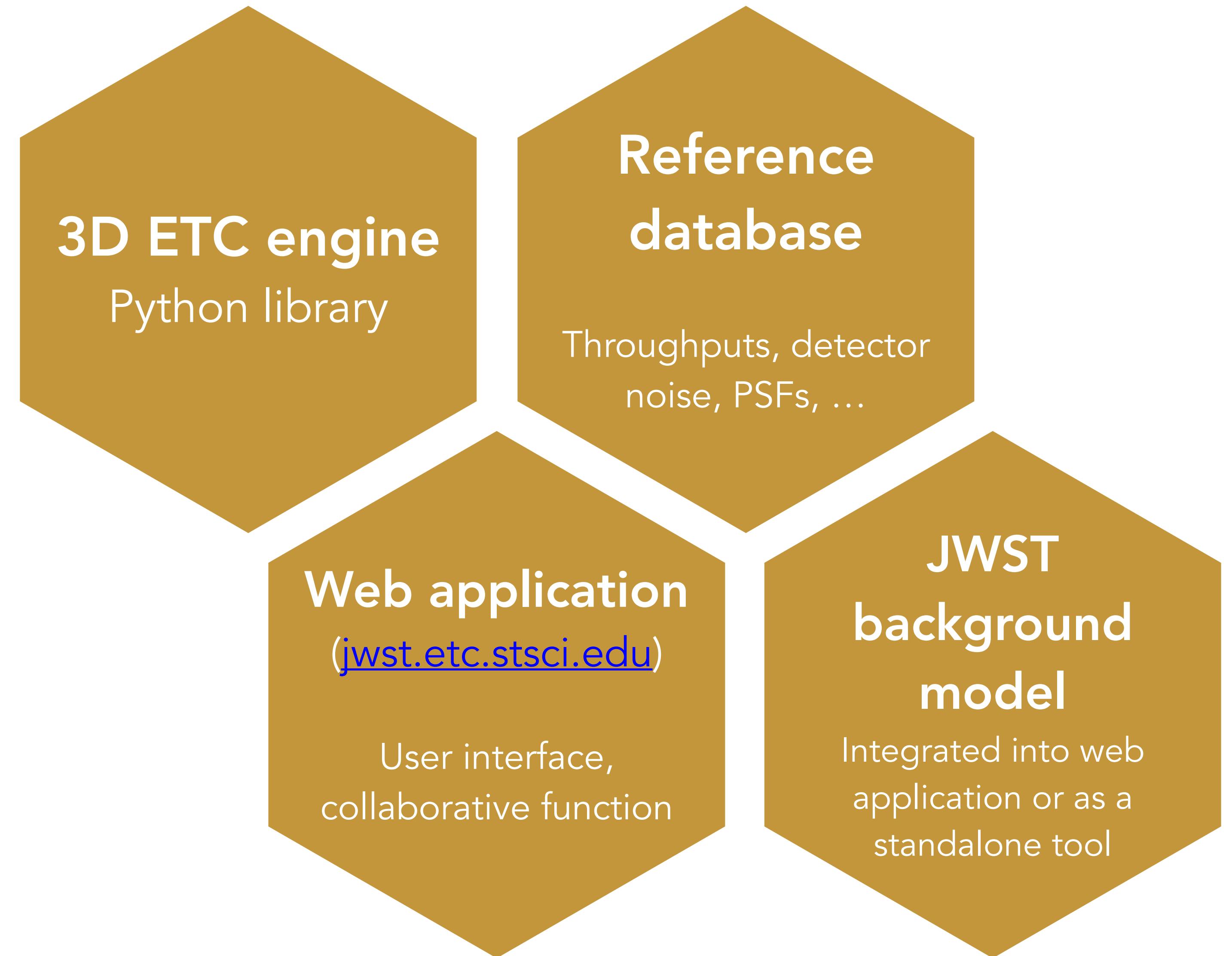
This release features new instrument modes, accuracy improvements, usability enhancements, and more: see the [Release Notes](#) for details, and be sure to review the [Known Issues](#) for this release.

When you log in to the 1.5 ETC, your old workbooks will be marked "Out of Date":

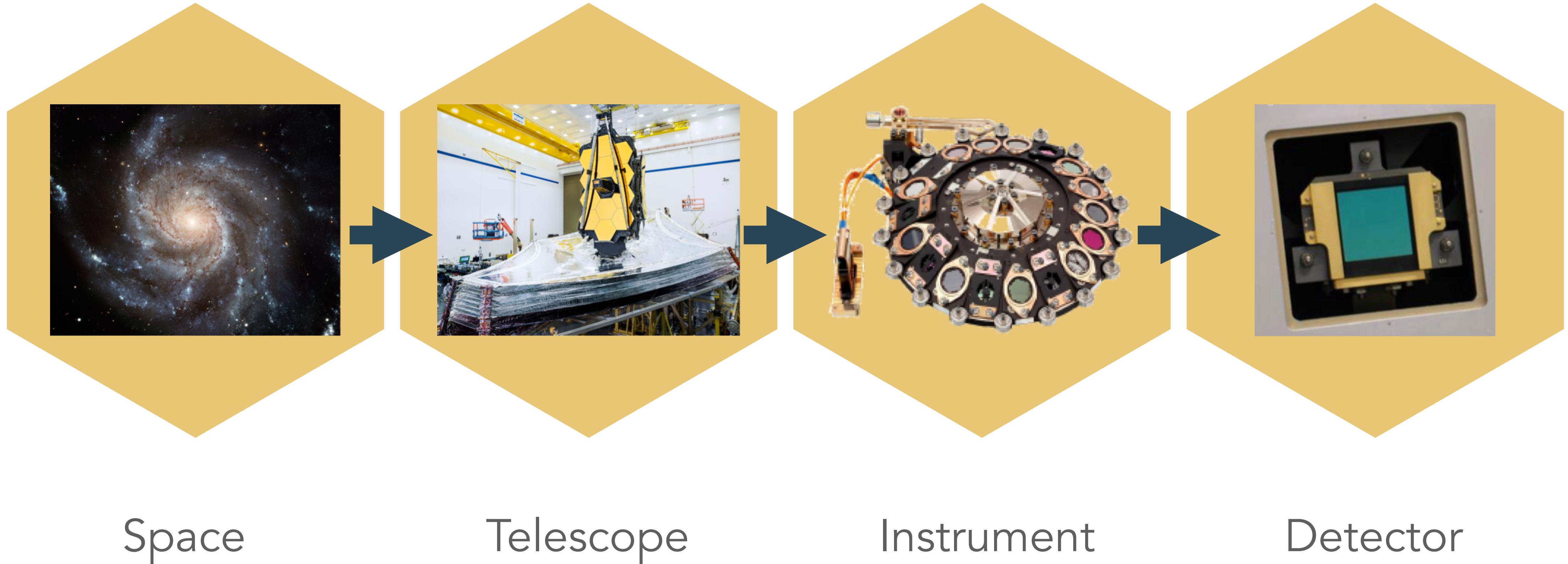
- When you load them, they will open in Read-Only mode: this ensures that your previous results are not overwritten and remain available to you for reference.
- If you copy an out of date workbook, and load the copy, all its calculations will be automatically updated for you with the current version of the software.
- For more information, see [ETC Releases and Out-of-Date Workbooks](#).

- See also
 - ▶ Pontoppidan et al., Proc. SPIE. 9910, Observatory Operations: Strategies, Processes, and Systems VI, 991016. July 15, 2016 (<https://arxiv.org/abs/1707.02202>)

The “Pandeia” project



The engine algorithm



Space

Telescope

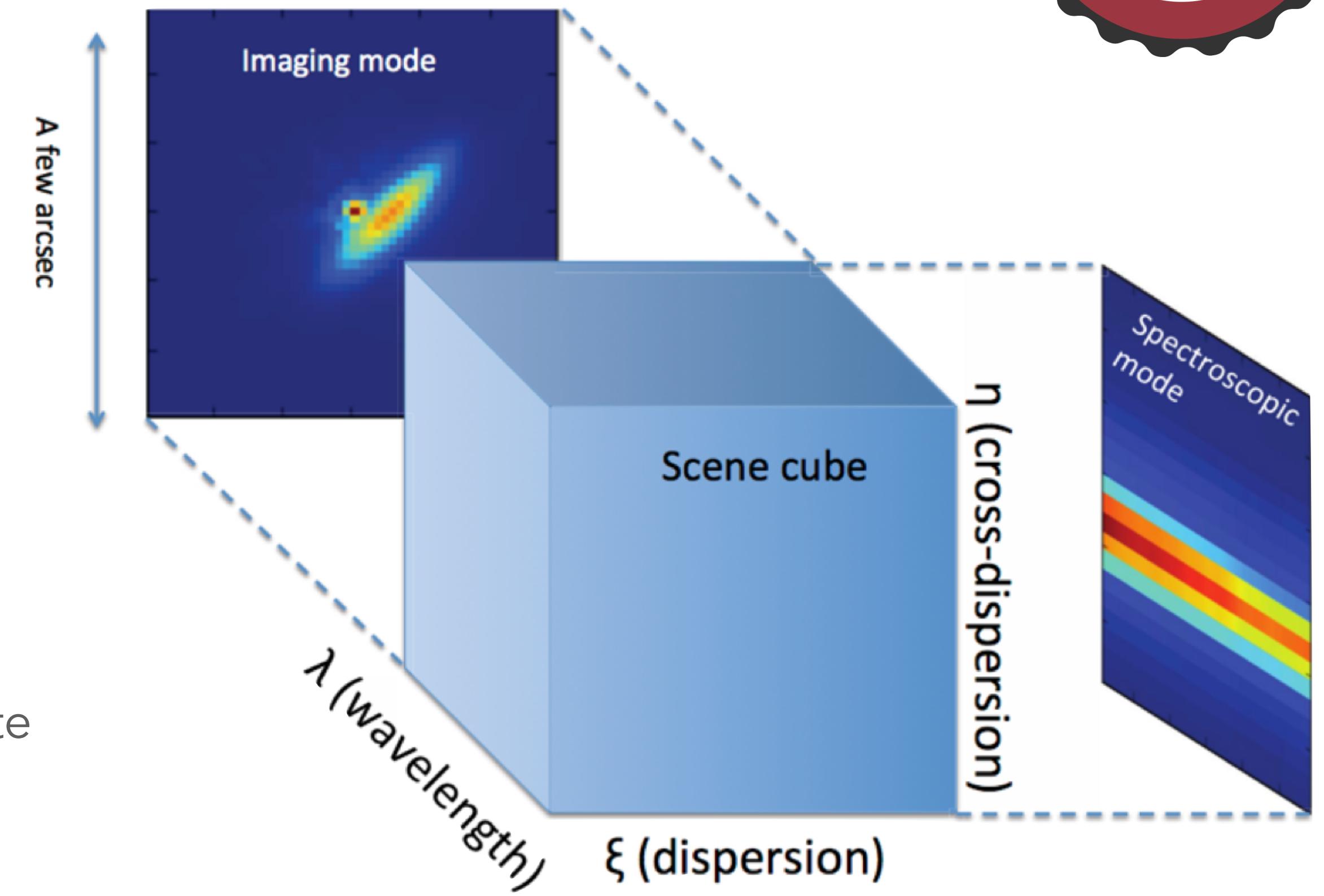
Instrument

Detector

JWST ETC concept



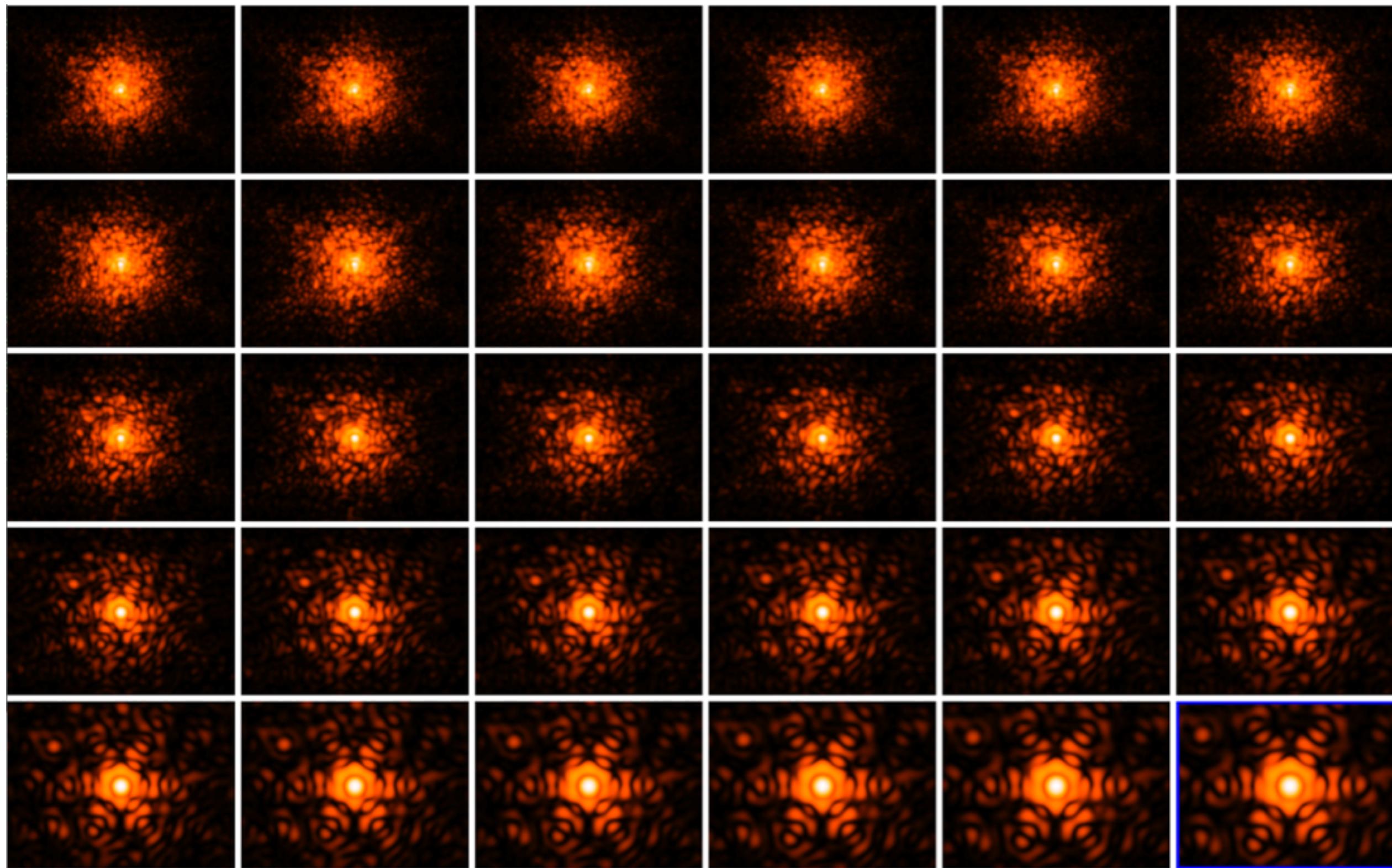
- Modern design
 - ▶ Signal (source + background) modelled in 3D
 - conserves flux
 - resolve lines
 - oversample JWST resolution
 - ▶ Pixel based:
 - Models the detector (e.g. correlated noise)
 - Final S/N calculation includes data analysis and post-processing steps ("strategy")
 - Allows the modelling of complex scenes (e.g. estimate contamination from bright sources)
- Supports all JWST modes



PSF library



- Uses WebbPSF to calculate PSF including realistic wavefront errors
- Almost 5000 individual monochromatic PSFs
- Subsampled by integer factor of pixel size

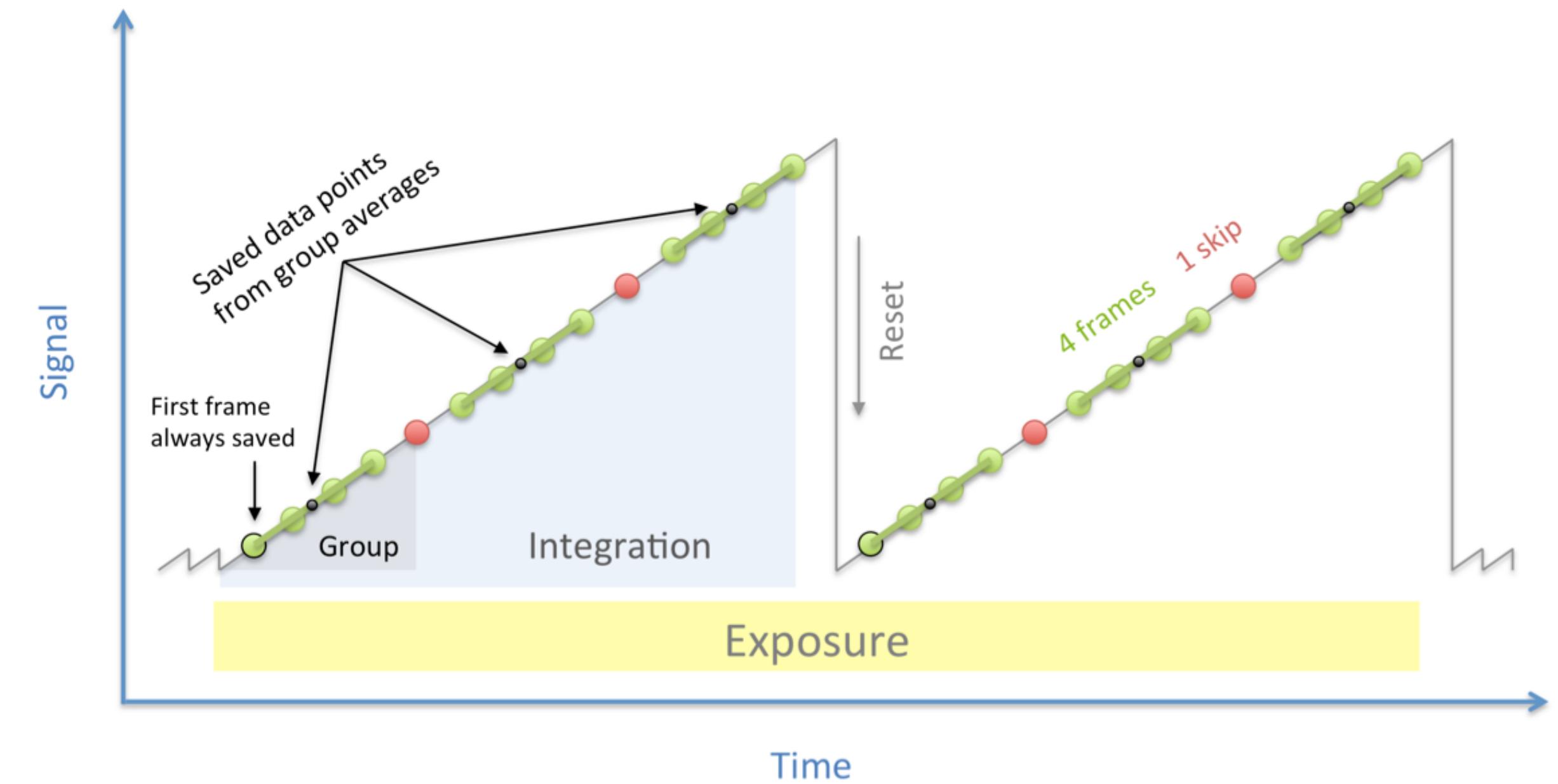


NIRCam SW PSFs
(0.6-5.2 micron)

Readout terminology



- **subarray**: the window on the detector being read out
- **frame**: one complete read of the detector or subarray
- **group**: a set of consecutive frames averaged onboard (some frames may be skipped)
- **integration**: one non-destructive ramp
- **exposure**: a set of consecutive integrations at the same pointing
- **dither**: an exposure at a new pointing

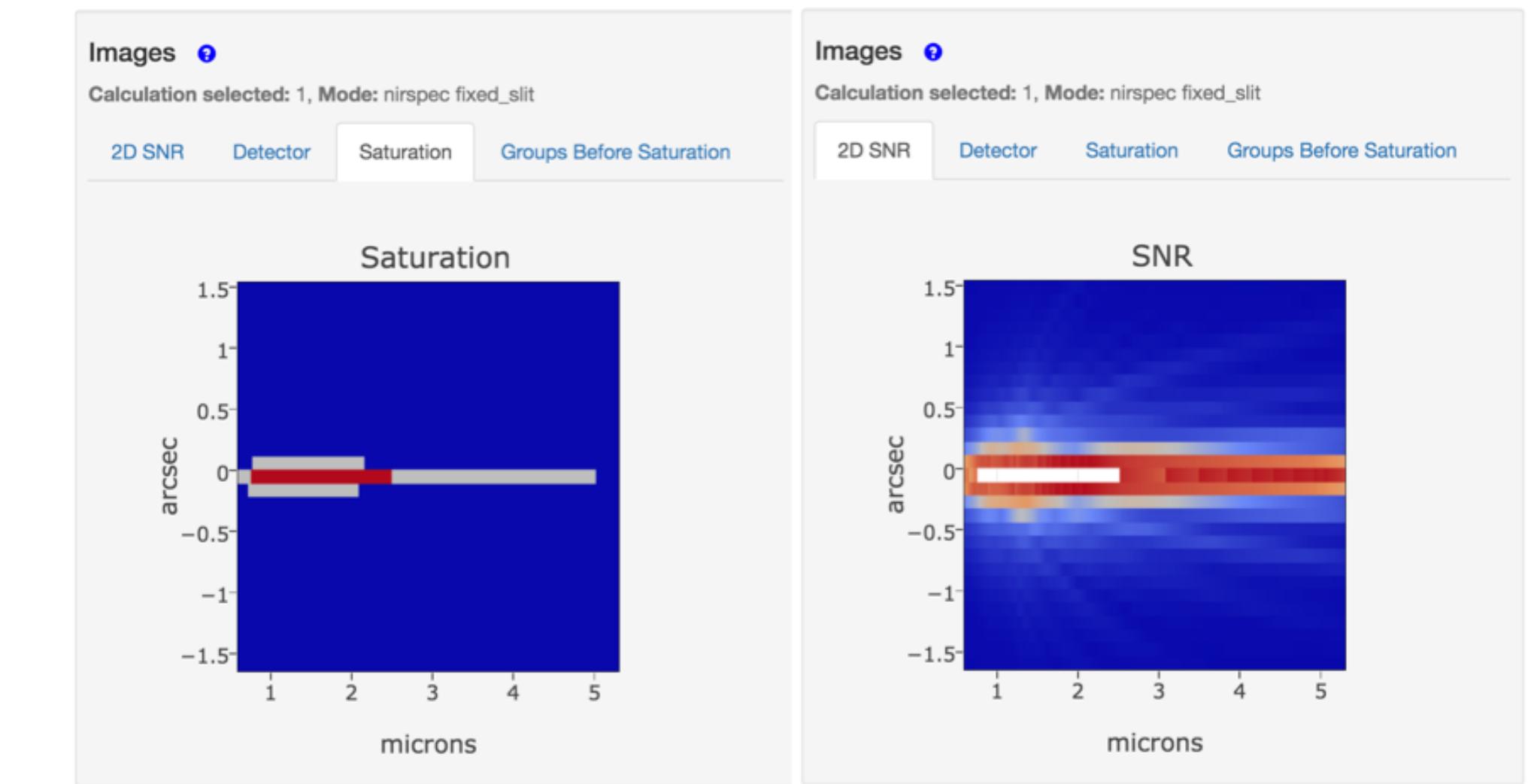
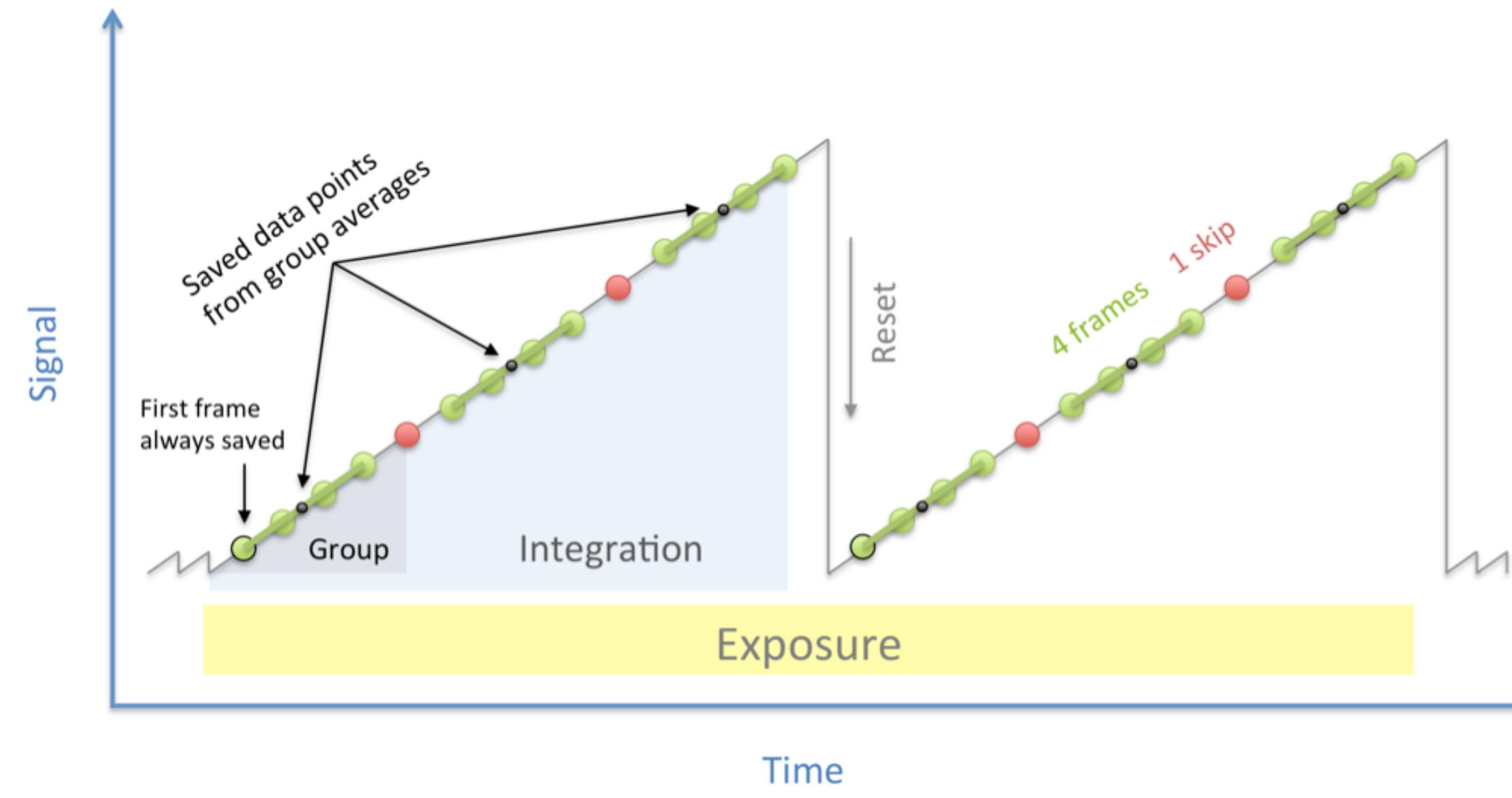




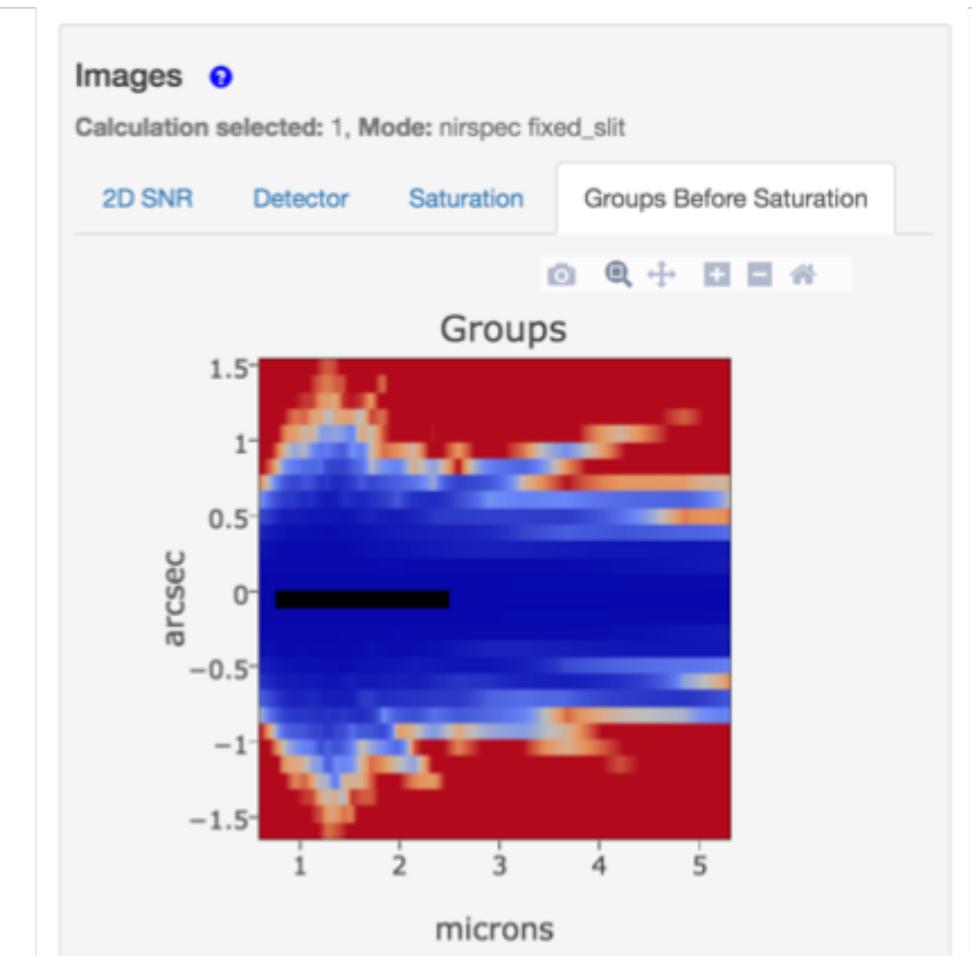
Time terminology

- **exposure time:** Time the detector is operating during a single exposure
 - ▶ includes resets
 - ▶ excludes initial synchronisation time
 - ▶ includes all integrations, but no repetitions per pointing, per tile, or per observation
- **measurement time:** For any individual pixel, the interval between first and last measurements during a single integration, multiplied by the number of integrations per exposure
 - ▶ used to determine count rate
- **saturation time:** For any individual pixel, the interval from reset to the final read of an integration, multiplied by the number of integrations per exposure
 - ▶ depends on exposure parameters, not target brightness or instrument throughput
- **exposure duty cycle:** measurement time divided by exposure time

How is saturation treated in ETC?



- Two types of saturation
 - ▶ **Partial saturation:** the integration saturates before it completes, but more than the minimum number of groups are unsaturated - DATA RECOVERED
 - ▶ **Full saturation:** the integration saturates before the minimum number of groups achieved - NO DATUM (for that pixel)
 - ▶ Usually, the minimum $n_{groups} = 2$



Tips for optimising detector set-up



- More frames per integration decreases read noise
- Longer groups decreases data volume
- Shorter groups decreases chance of cosmic ray hit per group
- More groups per integration make the cosmic ray correction better
- Longer integrations may make ramp fitting more certain
- More dithered exposures decreases flat-field errors and the impact of bad pixels

Note: in ETC, all exposures are assumed to be dithers, except for time-series observations

- Readout patterns that skip lots of frames have higher read noise, but slightly better duty cycle

JWST ETC features



- **Workbooks**

- ▶ Organise several ETC calculations into a workbook
- ▶ A workbook can contain multiple sources, scenes and calculations
- ▶ Workbooks remain in your MyST account, and are shareable

- **Reusability**

- ▶ Calculations in a workbook start with reasonable defaults
- ▶ Simply copy a calculation, modify the inputs as desired and recalculate

- **Batch expansion**

- ▶ Efficiently run a batch of many calculations
- ▶ Calculation is duplicated N times varying only the selected parameter
- ▶ Expansion over e.g. Ngroups offers a way to show the behaviour of SNR as a function of "exposure" time

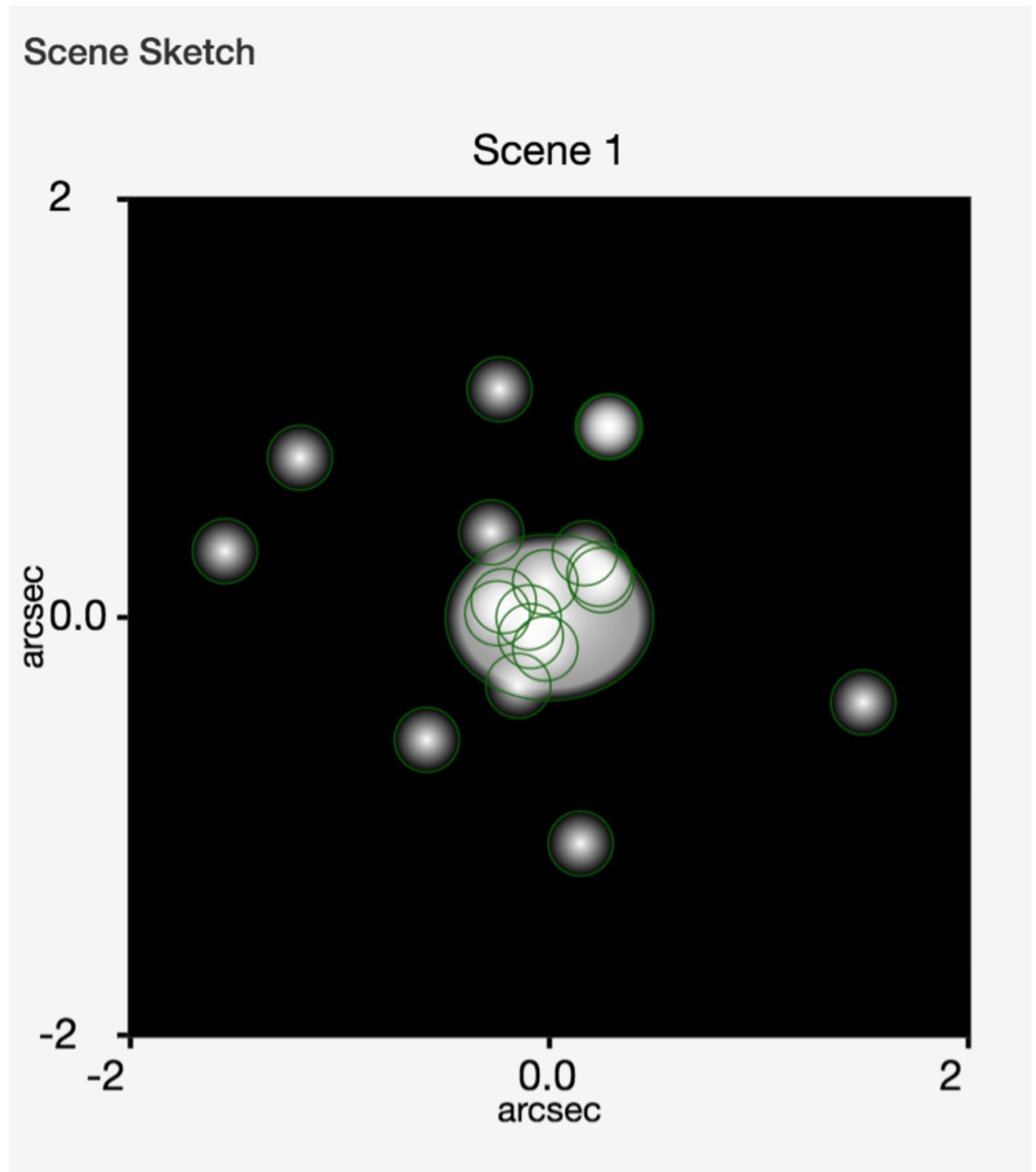
- **Auto-update**

- ▶ Changes made to the input, flow through to associated forms and calculations

Scenes and sources



- **Scene:** small postage-stamp of the sky (a few arcsec on a side)
 - A scene can have no source (just background) or multiple sources
 - Scenes can be reused in multiple calculations
- **Source:** specify SED, normalisation, extinction, emission lines and shape
 - Each sources can be reused in multiple scenes
 - Location: x,y offset (with orientation) within the postage stamp scene
 - Shape: point source or extended (flat, Gaussian, Sersic, power law...)
 - Spectrum:
 - Continuum: flat, black body, power law, templates
 - Lines: centre, width, flux
 - Normalise to magnitude/flux in JWST or HST bandpass, or at a λ
 - Upload a spectrum (ASCII or FITS format)



Issues to think about when using ETC



- ETC is a highly versatile tool
- There are many parameters affecting ETC sensitivities and program preparation
 - ▶ Different read-out patterns change the read noise
 - ▶ Be aware of saturation
 - ▶ Which background subtraction scheme?
 - ▶ Is the background correct for your target?
 - ▶ What extraction aperture is optimal? (Point or extended source?)
 - ▶ Does your extraction aperture contain contaminating flux from other sources in the scene?

Remember: ETC approximates our current best knowledge and understanding of performance. There are remaining uncertainties associated with system throughputs, detector noise properties, etc., which will remain unknown until JWST is in flight.

BEWARE: The ETC is not intended to be a complete observation simulator



Useful links

- JWST ETC (v1.5)
 - ▶ <https://jwst.etc.stsci.edu/>
- Documentation:
 - ▶ ETC introduction
 - ▶ Links to all pages, video tutorials and more
 - ▶ <https://jwst-docs.stsci.edu/jwst-exposure-time-calculator-overview>
- ETC release notes, known issues and FAQ (@ JWST Help Desk)
 - ▶ [JWST Help Desk ETC FAQ](#)
 - ▶ [JWST Help Desk ETC known issues](#)
- JWST Community Lecture Webcasts
 - ▶ ["The JWST Exposure Time Calculator"](#) - Klaus Pontoppidan (Nov 2019)
 - ▶ ["JWST ETC Demo" \(interface demonstration\)](#) - Swara Ravindranath (Feb 2017)