



**STScI** | SPACE TELESCOPE  
SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

# Specifying Observations in APT

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JWST Master Class Plenary

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## The JWST Astronomer's Proposal Tool

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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 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.
- Units are in decimal hours.



## APT Basics

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**Observation** – basic proposal design element specified by the user.

**Observation Template** – GUI form filled out by the user.

- Parameters depend on selection of instrument and mode.
- Contains the exposure specifications.

**Visit** – set of exposures (included overheads) obtained on a single guide star without scheduling interruptions. (This is the scheduling unit.)

- Observations are divided into one or more visits by APT.

**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

Instrument: MIRI

Template: MIRI Medium Resolution Spectroscopy

Target: 3 HH-111

Visit Splitting: Splitting Distance: 70.0 Arcsec, Number of Visits: 1

Duration (secs): 448, Total Charged: 5506

Data Volume: 1134 MB

MIRI Medium Resolution Spectroscopy | Mosaic Properties | Special Requirements | Comments

**Target Acquisition Parameters**

Acq Target: 4 SOMESTAR, Acq Filter: F560W

Acq Readout Pattern: FAST, Acq Groups/Int: 10, Acq Integrations/Exp: 1, Acq Total Integrations: 1, Acq Total Exposure Time: 27.75, Acq ETC Wbkb: 99999

**MRS Parameters**

Primary Channel: ALL

Dithers: 1, 4-Point, Optimized For: EXTENDED SOURCE, Direction: NEGATIVE

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: [JDoc 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
- Add-on to the Visit duration
  - Observatory overheads
    - Station keeping
    - Momentum management
  - Direct scheduling overheads
    - Very tight timing constraints
    - Rapid turnaround of target of opportunities

Visit 3:1	Status:	UNKNOWN					
	Science	Instrument Overheads	Slew	Observatory Overheads	Direct Scheduling Overheads	Total Charged	
Visit Duration (secs)	448	2498	1800	760	0	5506	
Data Volume	1134 MB						
<a href="#">Copy pointings to clipboard</a>							

(Note: Gray boxes contain information reported by APT for user information only; cannot be edited directly.)



# APT Visit Splitting Distance

- Users specify observation. APT splits an observation into one or more Visits using Visit Splitting Distance.
- This allowed distance for offsets within a visit is based on expected guide stars available, 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.
  - 30" for moving targets
- The Visits of a multi-visit observation are not guaranteed to execute in a continuous manner unless a special requirement 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"
$35^\circ \leq  b  < 45^\circ$	50"	$ b  \geq 80^\circ$	45"

Target

Splitting Distance  Number of Visits

Duration (secs)  Total Charged

Data Volume

Ex: Target is M-82, visit splitting distance 50.0"



# APT Visit Splitting Example

M82: Visit splitting distance = 50"

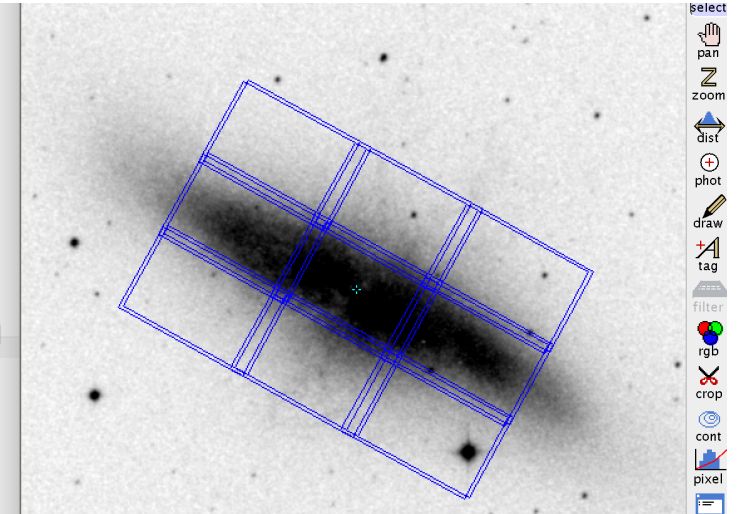
MIRI Imaging FoV: 74"x113"

3x3 MIRI Imaging mosaic using default tile overlap:

- 9 visits, 11.1 ks

Instrument	MIRI
Template	MIRI Imaging
Coordinated Parallel	<input type="checkbox"/>
Target	2 M82
Visit Splitting	Splitting Distance: 50.0 Arcsec, Number of Visits: 9
Duration (secs)	1512
Data Volume	1870 MB
Science	Total Charged: 11116

Rows	3	Columns	3
Row Overlap %	10.0	Column Overlap %	10.0
Row shift	0.0	Column shift	0.0
Tile Order	DEFAULT	<i>There are one or more visits for each tile so tile ordering has no effect</i>	



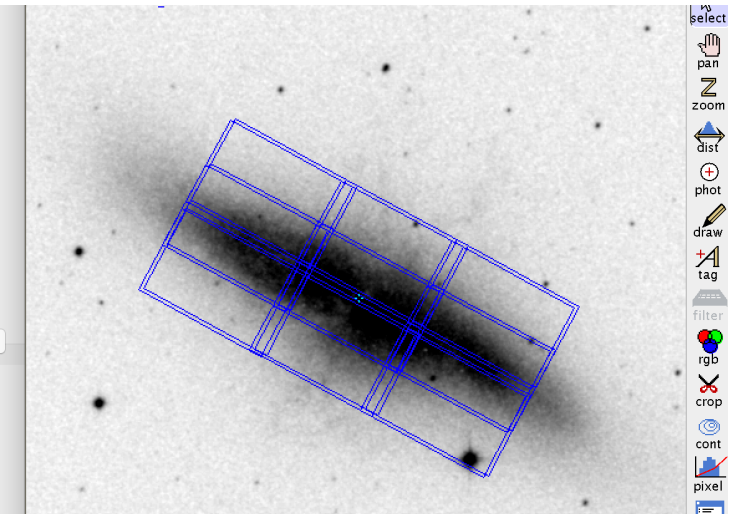
3x3 MIRI Imaging mosaic using 45% column overlap:

- 6 visits, 9.8 ks

By increasing tile overlap, the tile separation has been reduced below the Visit Splitting Distance, thus reducing the number of APT visits from 9 to 6.

Instrument	MIRI
Template	MIRI Imaging
Coordinated Parallel	<input type="checkbox"/>
Target	2 M82
Visit Splitting	Splitting Distance: 50.0 Arcsec, Number of Visits: 6
Duration (secs)	1512
Data Volume	1757 MB
Science	Total Charged: 9836

Rows	3	Columns	3
Row Overlap %	10.0	Column Overlap %	45.0
Row shift	0.0	Column shift	0.0
Tile Order	DEFAULT	<i>Default is HILBERT_CURVE</i>	



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

The background of the slide is a deep blue and purple starry night sky. A large, diffuse nebula with wispy, ethereal structures is visible, primarily on the left and bottom-left sides. The sky is filled with numerous stars of varying brightness and colors, including many bright blue stars. A thin, horizontal orange line is positioned below the title text.

# APT Observation Templates





# APT Observation Templates

Template Form changes based on selection of instrument and observing mode.

Ex: Coronagraphy requires a number of parameters not needed by other modes, so this only shows up when coronagraphy templates are selected.

Instrument: MIRI

Template: MIRI Coronagraphic Imaging

Target: 6 BET-PIC

Visit Splitting: 55.0 Arcsec

Number of Visits: 1

Duration (secs): 959

Total Charged: 4566

Data Volume: 730 MB

MIRI Coronagraphic Imaging | Special Requirements | Comments

**Target Acquisition Parameters**

Acq Target: Same Target as Observation

Acq Filter: FND

Acq Readout Pattern: FAST

Acq Groups/Int: 6

Acq Integrations/Exp: 1

Acq Total Integrations: 1

Acq Total Exposure Time: 1.438

Acq ETC W: 99999

Acq Quadrant: 1

**Coron Parameters**

Coron Mask/Filter: 4QPM/F1065C

Mask: 4QPM

Filter: F1065C

Readout Pattern: FAST

Groups/Int: 40

Integrations/Exp: 100

Exposures/Dith: 1

Total Dithers: 1

Total Integrations: 100

Total Exposure Time: 958.72

Dither Type: NONE

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



# APT Observation Templates

Other operations that can change based on selected Templates:

- Whether mosaicking is allowed

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

- Whether coordinated parallels are allowed (and choices available)

Prime Instrument: NIRCAM  
Template: NIRCam Imaging  
Coordinated Parallel:  NIRCam-MIRI Imaging  
Module: ALL  
Subarray: FULL  
Dither Parameters: FULL, 9, 3-POINT-WITH-MIRI-F560W

#	Short Filter	Long Filter	Readout Patter...	Groups/Int	Integrations/...	Total Dithers	Total Integrati...	Tot
1	F200W	F444W	DEEP2	10	1	27	27	52



# APT Observation Templates

Other operations that can change based on selected Templates:

- Whether Target Acquisition is needed (or not)
- Details of dithering and filter/grating selections available

Instrument: MIRI

Template: MIRI Coronagraphic Imaging

Target: 6 BET-PIC

Visit Splitting: Splitting Distance: 55.0 Arcsec, Number of Visits: 1

Duration (secs): 959, Total Charged: 4566

Data Volume: 730 MB

MIRI Coronagraphic Imaging | Special Requirements | Comments

**Target Acquisition Parameters**

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

Acq Exposure Time: FAST, Acq Groups/Int: 6, Acq Integrations/Exp: 1, Acq Total Integrations: 1, Acq Total Exposure Time: 1.438, Acq ETC Wk: 99999

Acq Quadrant: 1

**Coron Parameters**

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

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

**Dither Type**

Dither Type: NONE, 5-POINT-SMALL-GRID, 9-POINT-SMALL-GRID



# APT Target Acquisition

- Some templates have no target acquisition
- Some templates require a target acquisition
- Some templates, the target acquisition is optional

***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.

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.Calc ID	ETC
FAST	10	1	1	27.75	99999	

Note: optional annotation box, useful for documenting your calculation ID!

## Additional Resources:

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



# APT Observation Templates

Instrument: NIRCAM

Template: NIRCcam Imaging

Coordinated Parallel:

Target: 1 M-51

Visit Splitting:	Splitting Distance	Number of Visits
40.0 Arcsec	40.0 Arcsec	18

Duration (secs)	Science	Total Charged
774	774	21119

Data Volume: 7001 MB

Module: ALL

Subarray: FULL

Dither Parameters: FULL, 3, STANDARD

*FULL\* dither types take large steps that result in variable depth over the imaged in ETC.*

#	Short Filter	Long Filter	Readout P...	Groups/Int	Inte
1	F200W	F444W	RAPID	2	2

Filters

No Target Acquisition needed

Instrument: MIRI

Template: MIRI Coronagraphic Imaging

Target: 6 BET-PIC

Visit Splitting:	Splitting Distance	Number of Visits
55.0 Arcsec	55.0 Arcsec	1

Duration (secs)	Science	Total Charged
959	959	4560

Data Volume: 730 MB

MIRI Coronagraphic Imaging

**Target Acquisition Parameters**

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

Acq Exposure Time	Acq Readout Pattern	Acq Groups/Int	Acq Integrations/Exp	Acq Total Integrations	Acq Total
FAST	FAST	6	1	1	1.438

Acq Quadrant: 1

**Coron Parameters**

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

Exposure Time	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integration
FAST	FAST	40	100	1	1	100

Target Acquisition needed

A background image of a starry night sky. In the center, there is a large, glowing nebula with intricate, wispy structures in shades of blue, purple, and brown. The sky is filled with numerous stars of varying colors, including bright blue, white, and yellow. A thin, horizontal orange line is drawn across the middle of the image, positioned just below the text.

# APT Special Requirements



# APT Special Requirements

Additional constraints placed on specific observations.  
Applied at the observation level.

- Affects all visits within an observation

Explicit requirements: set by user

- Must be justified by the science goals
- Can decrease scheduling availability

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

Add...   Remove   Edit

Implicit Requirements

Group Visits within 53.0 Days  
Visits Same PA

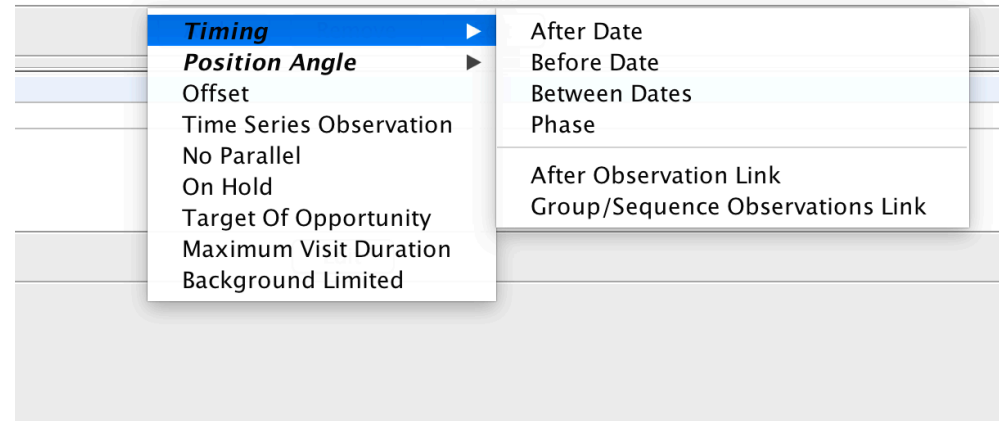
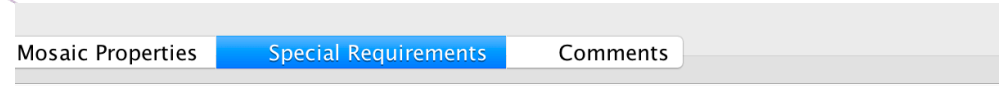
Edit

Additional Resources:

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

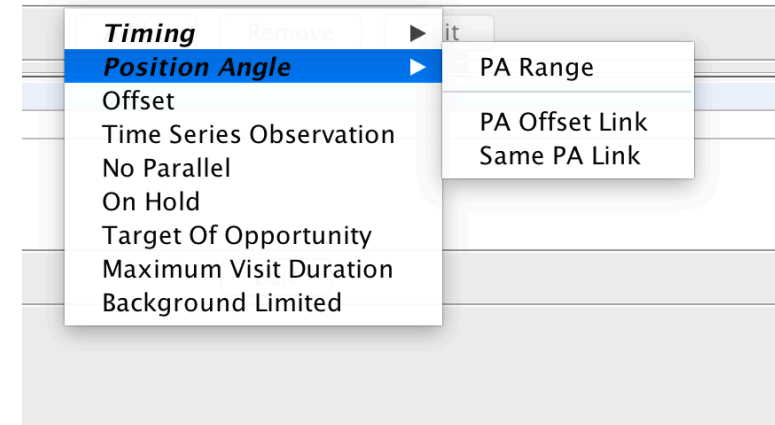
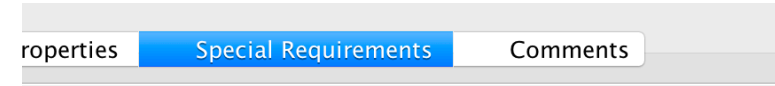


# APT Special Requirements



## Timing requirements: Several options

- Observation needs to execute at a particular time or time window.
- Observation needs to happen at some time relative to another observation.
- Several observations need to execute together without interruption.



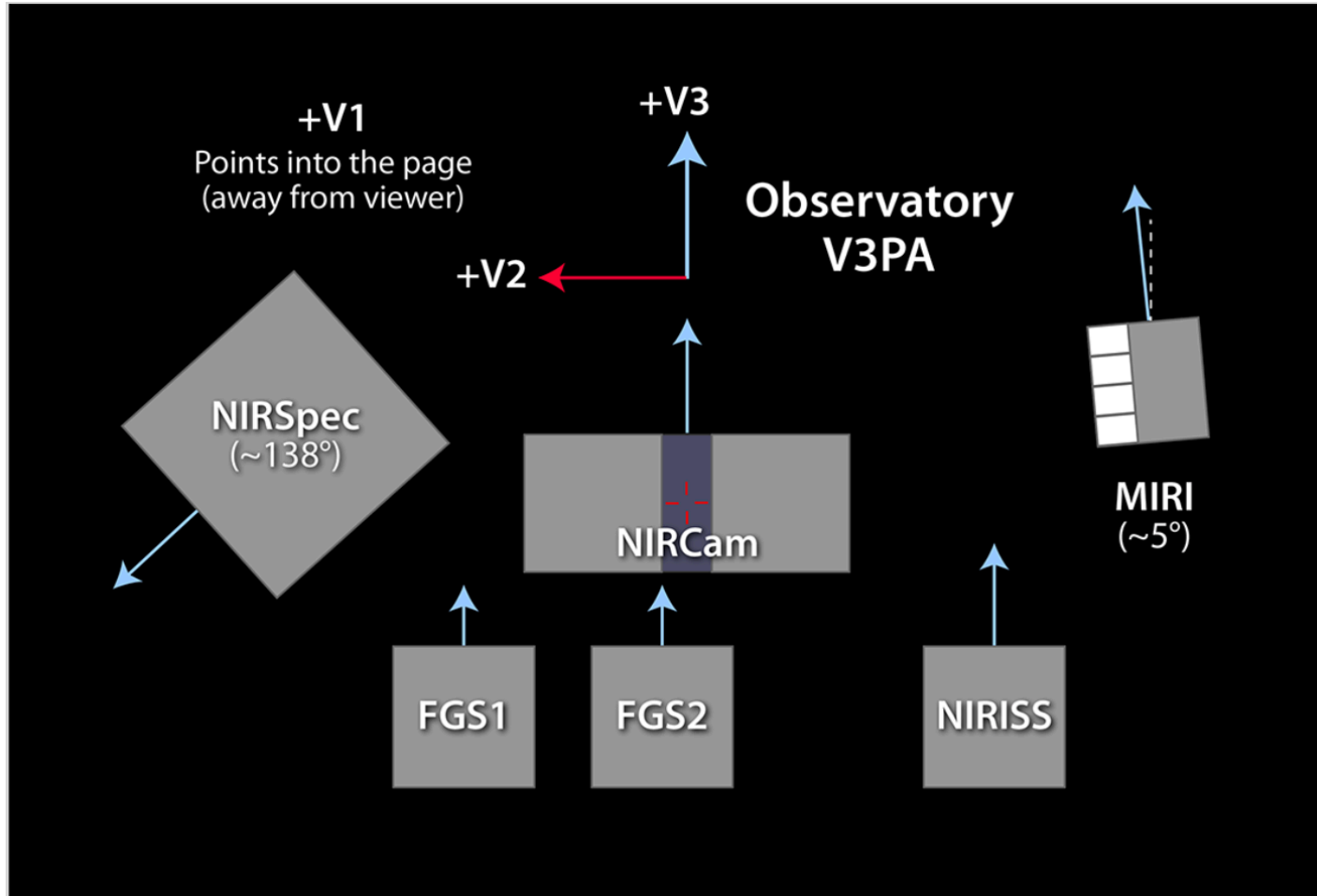
## Position angle requirements: Several options

- Observation needs to execute at a particular PA or within some range.
- Observation needs to happen at an offset angle from another observation.
- Observation needs to happen at same angle as another observation





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



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

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.

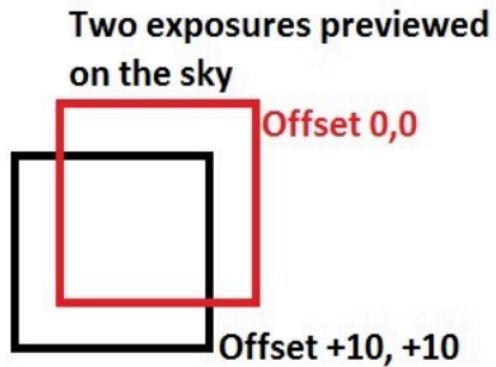
Additional Resource: [JDox Article: Position Angles, Ranges and Offsets](#)



# APT Special Requirement

An Offset specifies a non-default placement of the target, relative to the aperture fiducial point in the instrument field of view, which must be on an external target.

Two exposures overlaid



Ex: Offset special requirement

APT Aladin Controls (all JWST apertures are preliminary)

Aladin v8.1

Location: STScI POSS2UKSTU\_Red 05:51:41.36 - 02:48:40.4

Move: Visit 12:1  
From: POS TARG (0, 0)  
To: POS TARG (-99.43, -33.22)

4.371' x 4.79'

MIRI Imaging Mosaic Properties **Special Requirements** Comments

Offset

Offset X -99.43 Arcsec  
Offset Y -33.22 Arcsec

Offset -99.43 arcsec, -33.22 arcsec

OK



# APT Visit Planner

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## APT Visit Planner

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The APT visit planner performs a detailed check of the *schedulability* of the visits in observations, including visibility, constraint checking, and whether guide stars are available.

Diagnostic information is provided when scheduling checks fail. But interpreting this information can be tricky.

The following slides walk through a couple of example cases to give you a sense of how to use the available reports and graphs.

Additional Resources:

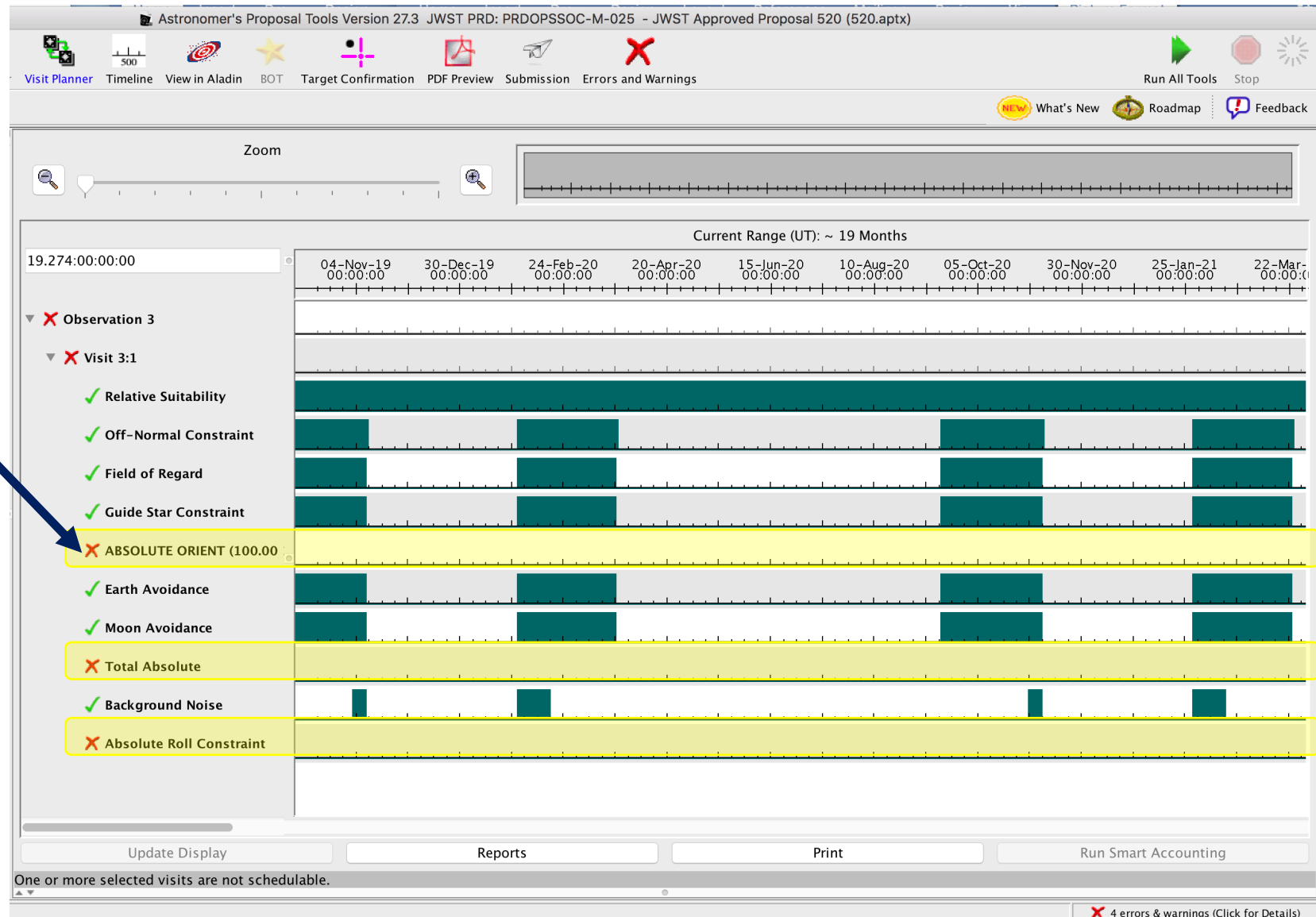
- [JDox Article: APT Visit Planner](#)
- [YouTube Video Tutorial: APT Visit Planner](#)



# APT Visit Planner Diagnostics - Position Angle Problems

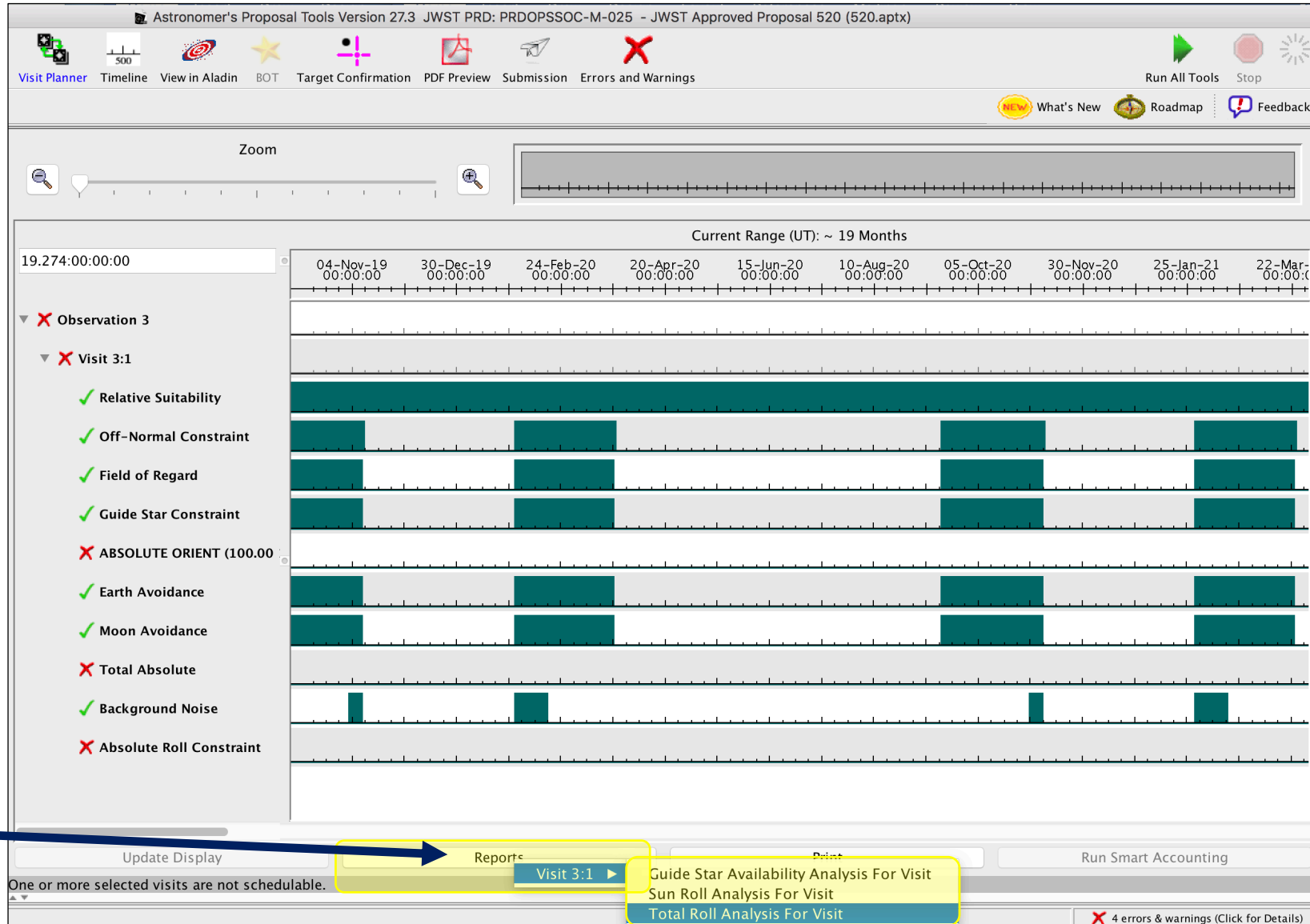
Observation fails scheduling check:  
Issue with ORIENT (aka position angle)

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





# APT Visit Planner Diagnostics – Position Angle Problems

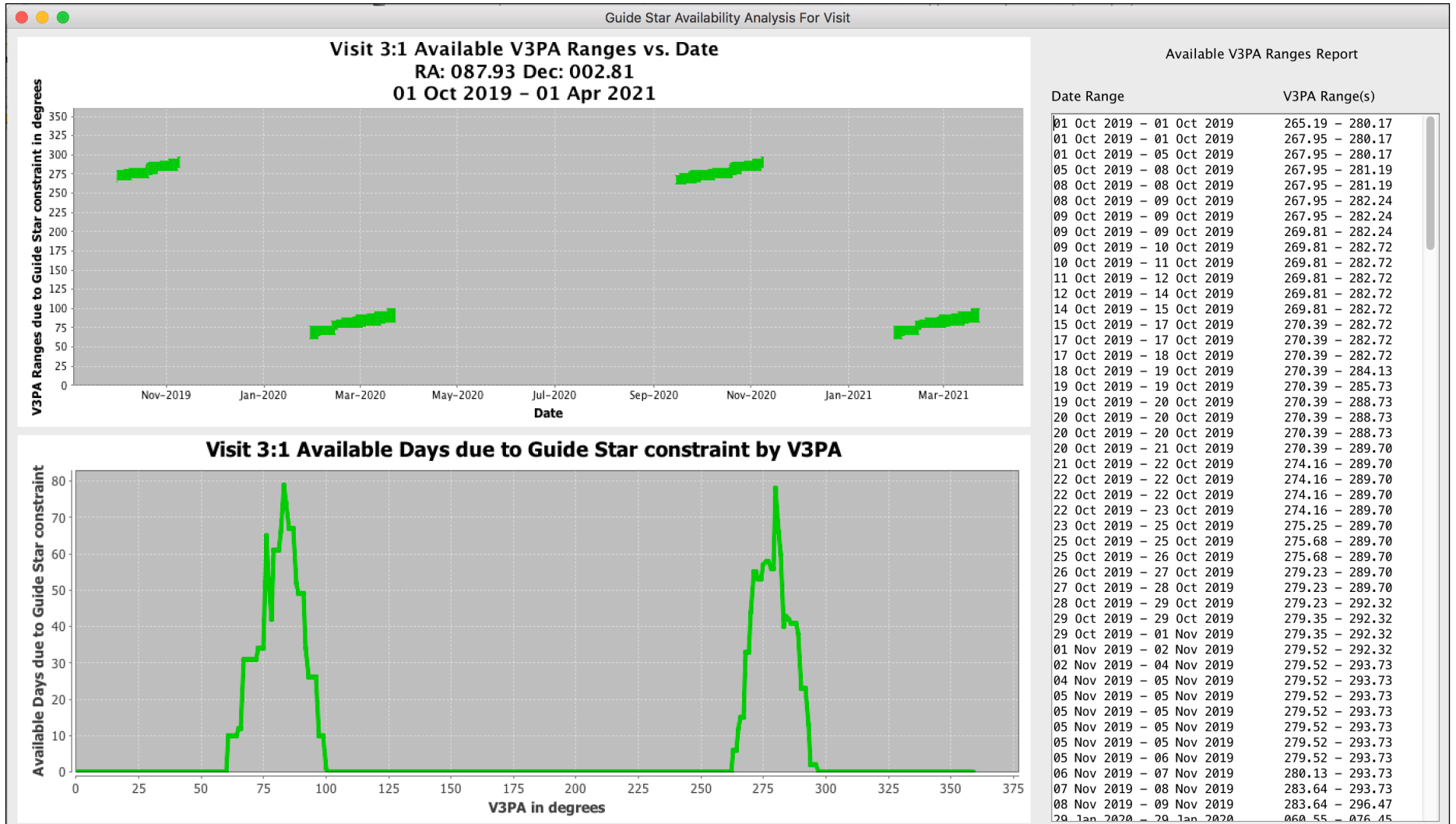


To review the Roll Angle Report/Graph



# APT Visit Planner Diagnostics – Position Angle Problems

Graph shows range of V3 position angles available as a function of date.



Graph shows the number of days each V3 position angle is available.

Report of Available Date/Angle Ranges



# APT Visit Planner Diagnostics – Position Angle Problems

Astronomer's Proposal Tools Version 27.3 JWST PRD: PRDOPSSOC-M-025 - JWST Approved Proposal 520 (520.aptx)

Timeline View in Aladin BOT Target Confirmation PDF Preview Submission Errors and Warnings

Observation 3 of JWST Approved Proposal 520 (520.aptx)

Number: 3 Status: UNKNOWN

Label: [ ]

Instrument: MIRI

Template: MIRI Medium Resolution Spectroscopy

Target: 3 HH-111

Visit Splitting:	Splitting Distance	Number of Visits
	70.0 Arcsec	1

Duration (secs)	Science	Total Charged
448		5506

Data Volume: 1134 MB

MIRI Medium Resolution Spectroscopy Mosaic Properties **Special Requirements** Comments

Special Requirements: Background Limited. Background no more than 10% above minimum

Implicit Requirements:

- Timing
- Position Angle**
  - PA Range
  - PA Offset Link
  - Same PA Link
- Offset
- Time Series Observation
- No Parallel
- On Hold
- Target Of Opportunity
- Maximum Visit Duration
- Background Limited

PA Range

Aperture PA Range 79.449705 to 79.449705 Degrees V3 PA Range: 75.00 to 75.00  Set using V3

Aperture PA Range 79.449705 to 79.449705 Degrees (V3 75.0 to 75.0)

OK

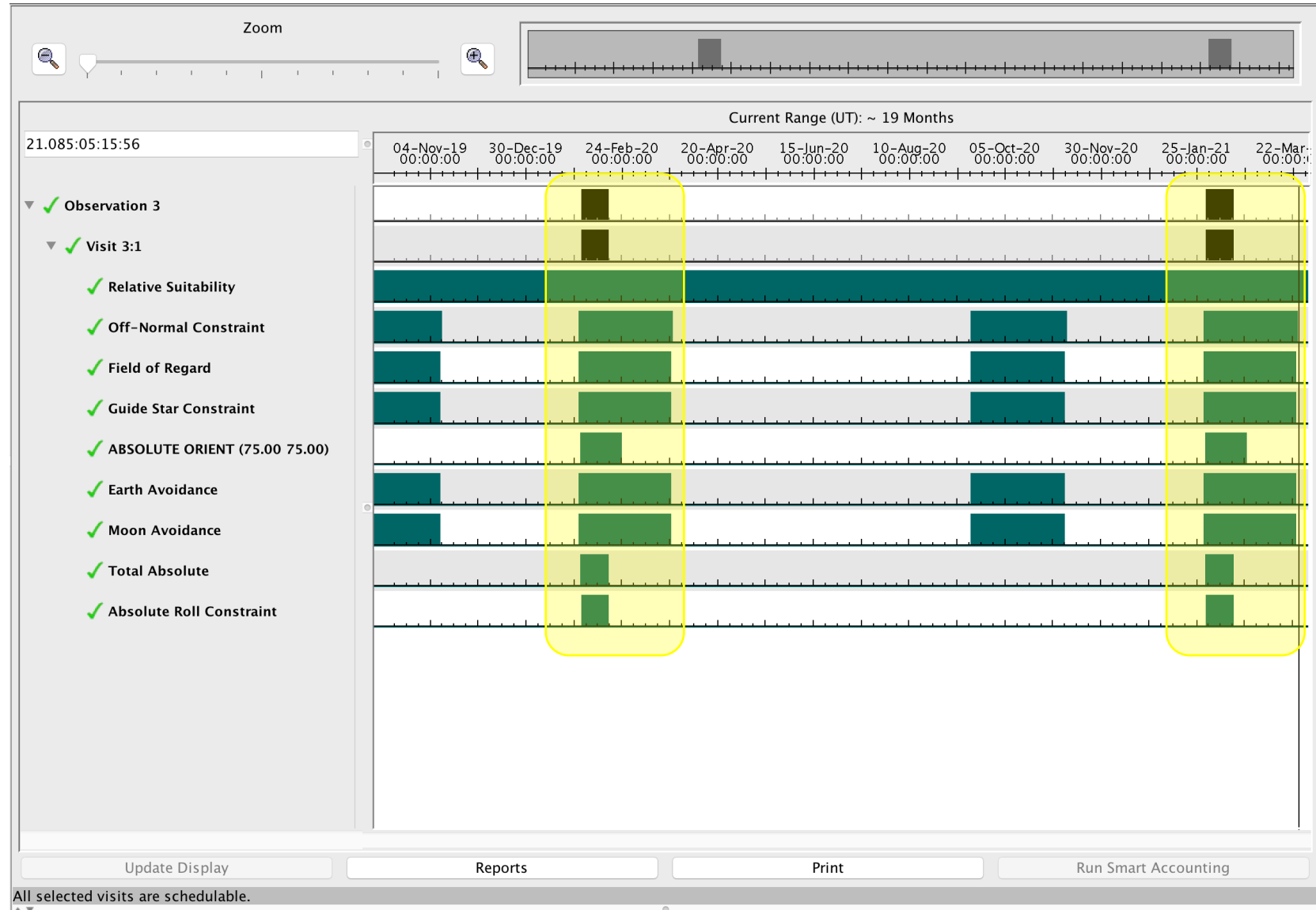
Go to the Special Requirements in template, edit the V3PA





# APT Visit Planner Diagnostics - Position Angle Problems

Observation now passes scheduling check:  
All constraints have green check marks and the constraint windows overlap.

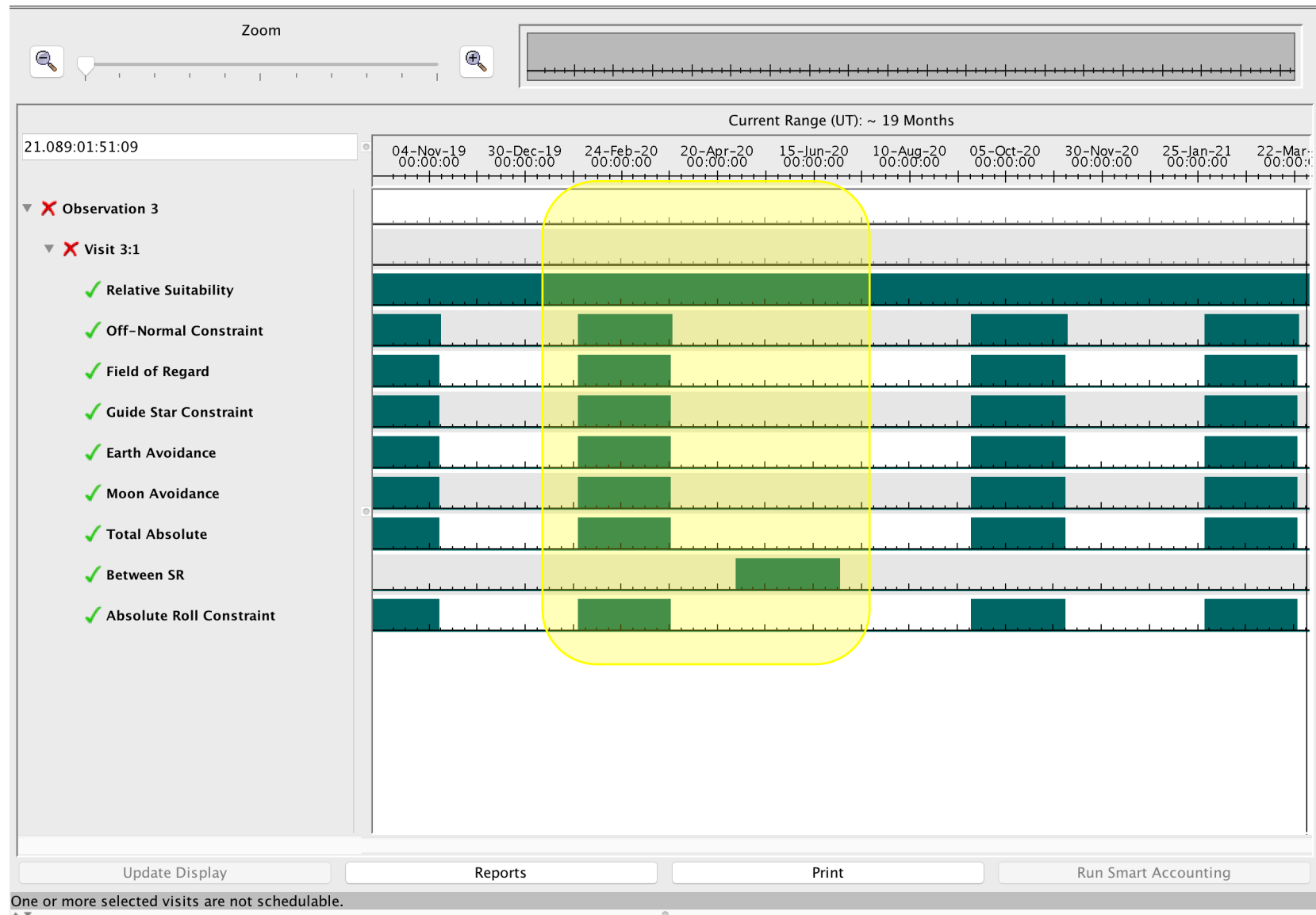




# APT Visit Planner Diagnostics - Timing Problem

Observation fails scheduling check:  
Timing constraint does not allow scheduling as specified.

Note: all constraints windows need to overlap for schedulability!



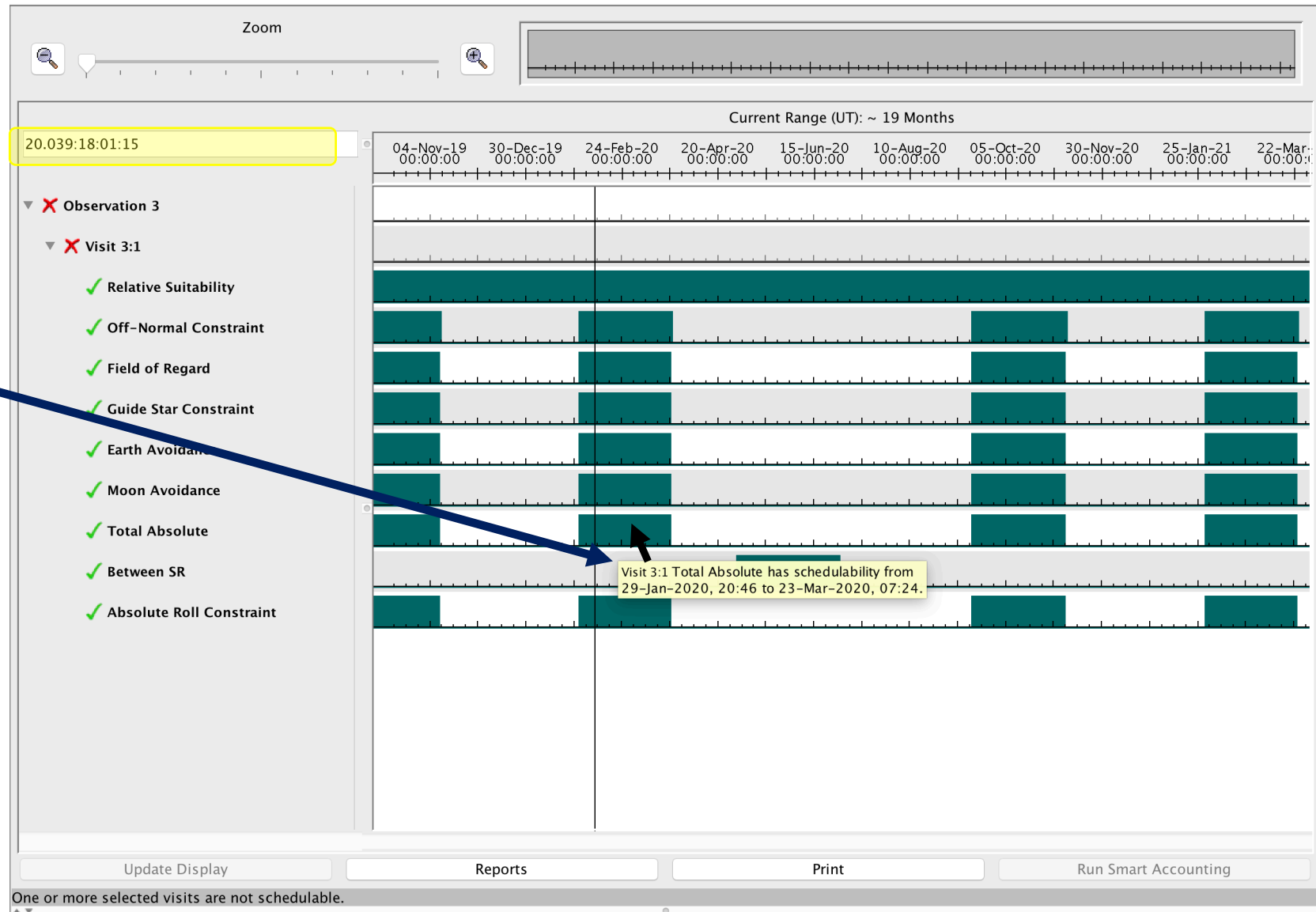


# APT Visit Planner Diagnostics - Timing Problem

Examine the issue:  
The requested  
BETWEEN time is not  
available.

Hover cursor over a  
constraint window to  
view schedulable time  
range in pop up window.

The vertical slider bar  
can be used to read  
specific times, listed at  
upper left (yellow  
highlight).





# APT Visit Planner Diagnostics - Timing Problem

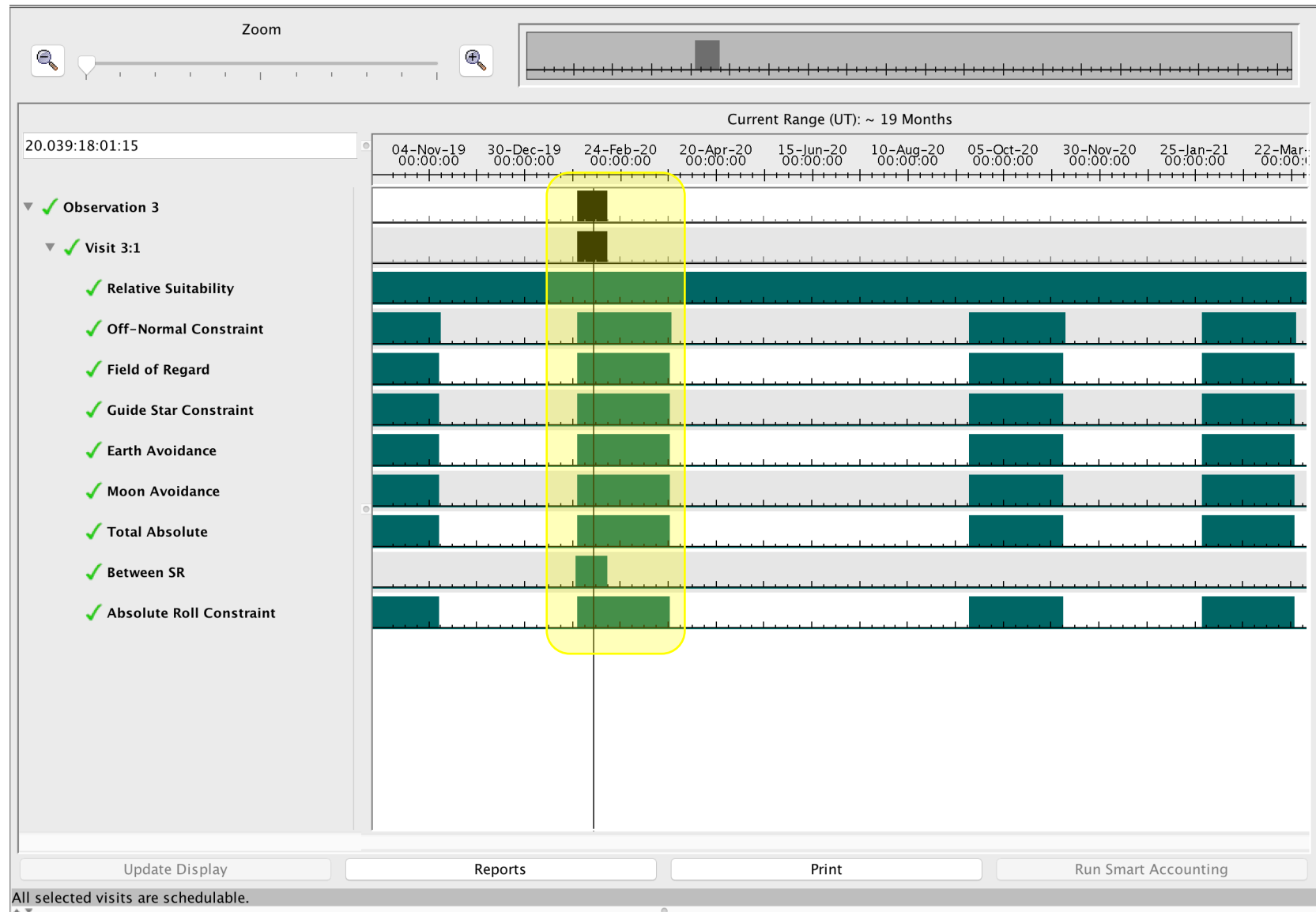
Go to the Special Requirements in template, enter a time constraint that will work.

The screenshot displays the APT Visit Planner interface. At the top, there are input fields for 'Number' (3), 'Status' (UNKNOWN), 'Label', 'Instrument' (MIRI), 'Template' (MIRI Medium Resolution Spectroscopy), and 'Target' (3 HH-111). Below these are fields for 'Visit Splitting' (70.0 Arcsec, 1), 'Duration (secs)' (448, 5506), and 'Data Volume' (1134 MB). A tabbed interface shows 'MIRI Medium Resolution Spectroscopy', 'Mosaic Properties', 'Special Requirements', and 'Comments'. The 'Special Requirements' tab is active, showing a 'Between Dates' dialog box with the following text: 'Legal date formats: DD-MMM-YYYY:hh:mm:ss or YYYY.DDD:hh:mm:ss', 'After date' (29-JAN-2020:00:00:00), and 'Before date' (23-MAR-2020:00:00:00). The dialog also displays 'Between Dates 29-JAN-2020:00:00:00 and 23-MAR-2020:00:00:00' and an 'OK' button. A context menu is open over the 'Special Requirements' area, listing options: 'Timing', 'Position Angle', 'Offset', 'Time Series Observation', 'No Parallel', 'On Hold', 'Target Of Opportunity', 'Maximum Visit Duration', 'Background Limited', 'After Date', 'Before Date', 'Between Dates', 'Phase', 'After Observation Link', and 'Group/Sequence Observations Link'. The 'Between Dates' option is highlighted. At the bottom, there are navigation buttons: 'Edit HH111 spectroscopy', 'New', and 'Edit Visit 3:1'.



# APT Visit Planner Diagnostics - Timing Problem

Observation now passes scheduling check:  
All constraints have green check marks and the constraint windows overlap.





# Other Useful APT Capabilities

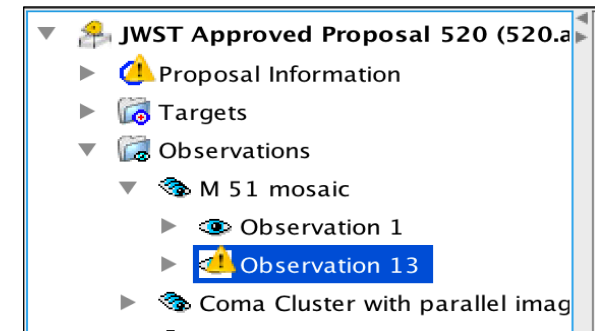
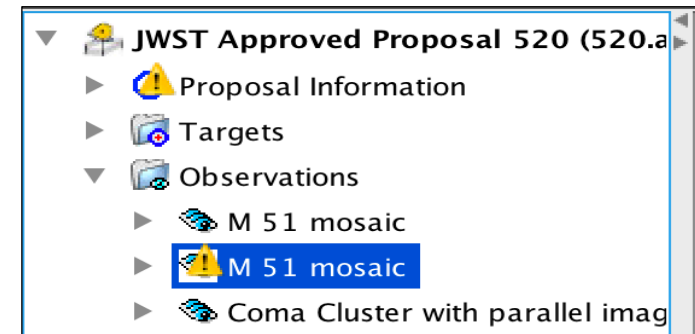
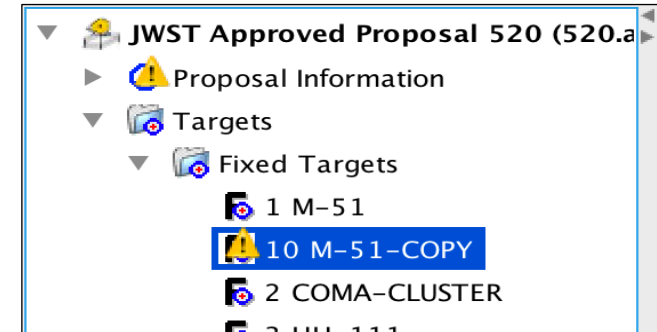
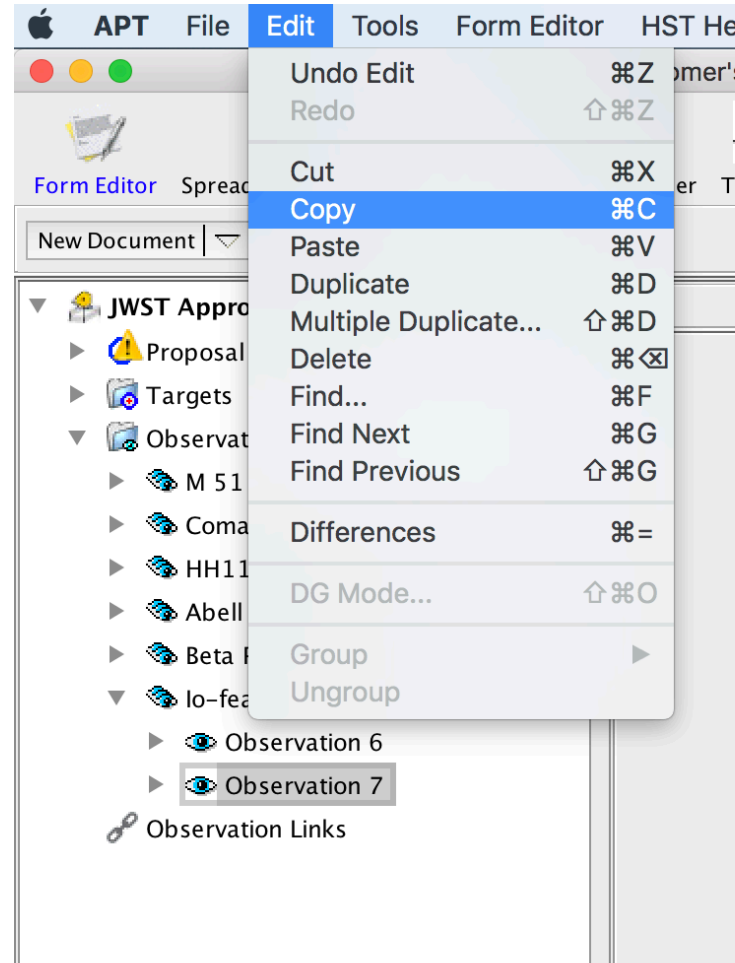
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## Other Useful APT Capabilities – Copy/Paste

Copy/Paste a target, observation folder, or observation within your proposal or into a separate proposal.

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

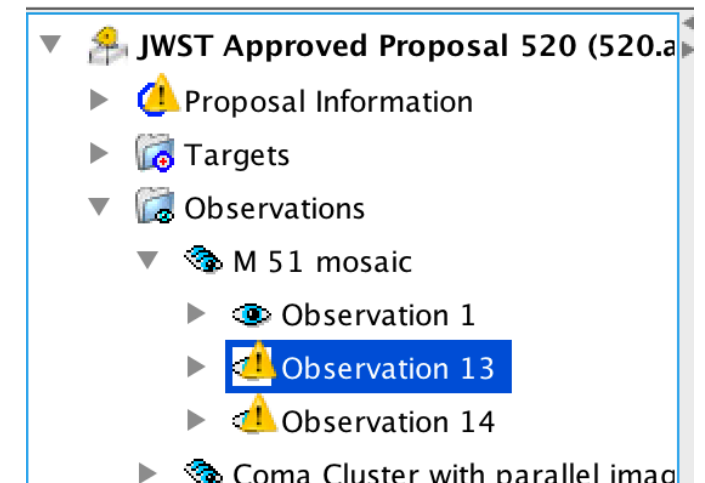
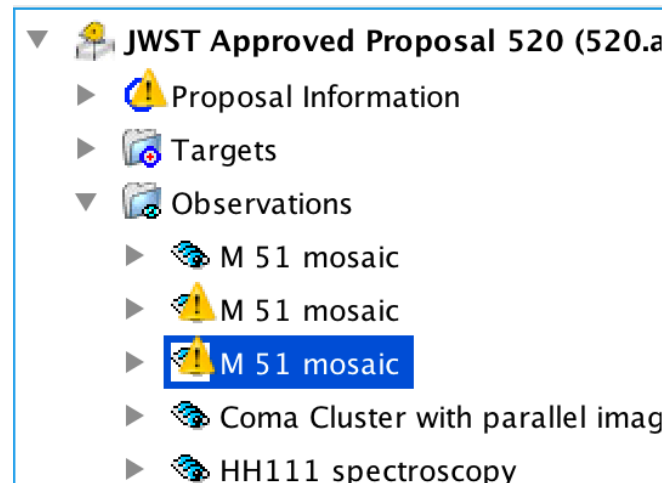
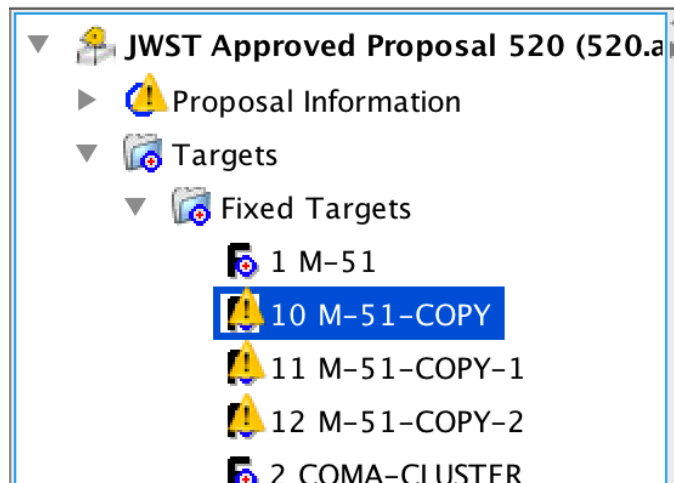
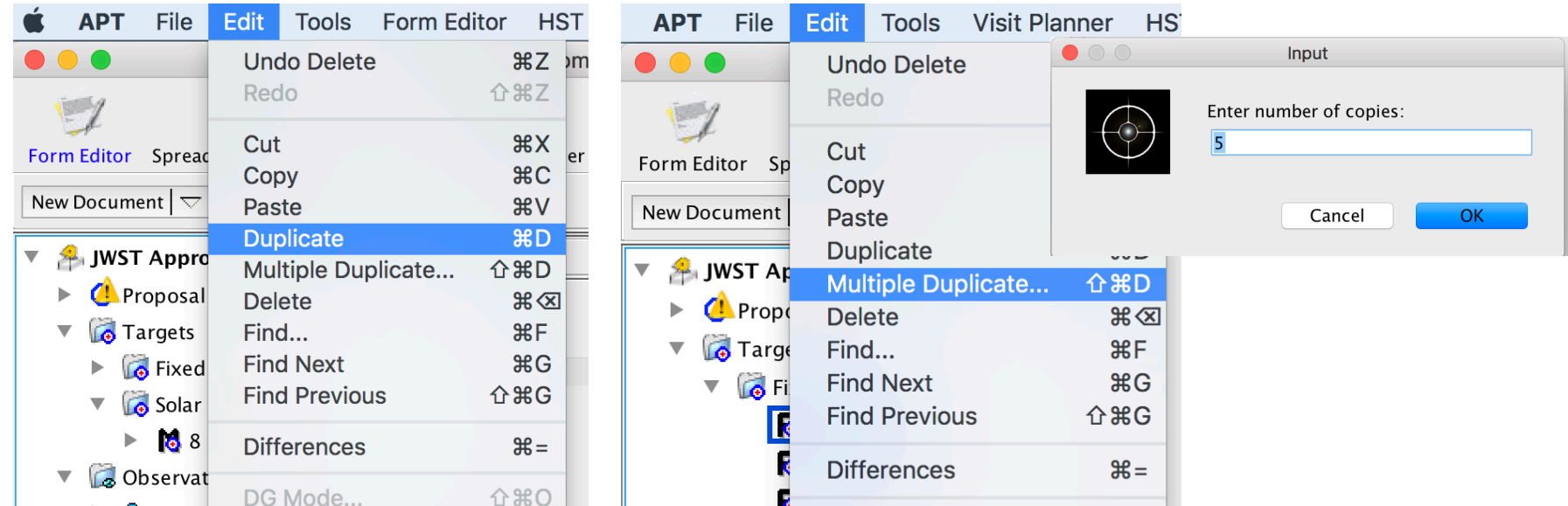




# Other Useful APT Capabilities – Duplicate

Duplicate/Multiple Duplicate a target, observation folder or observation

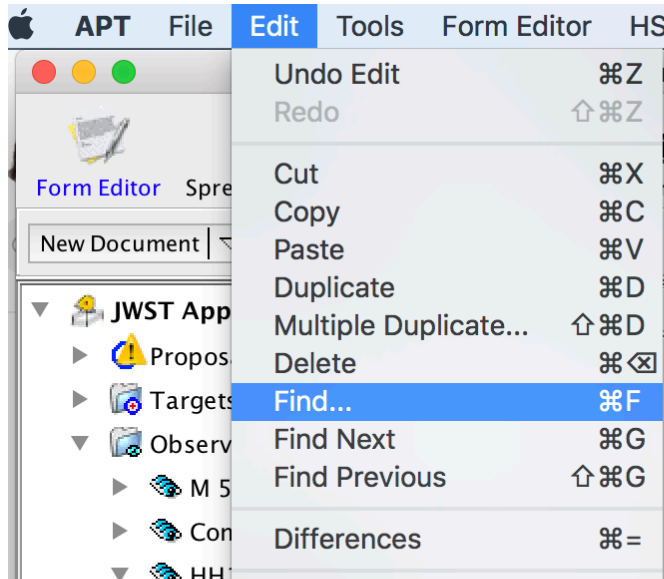
Important to revise a label to provide clear tracking within your proposal.





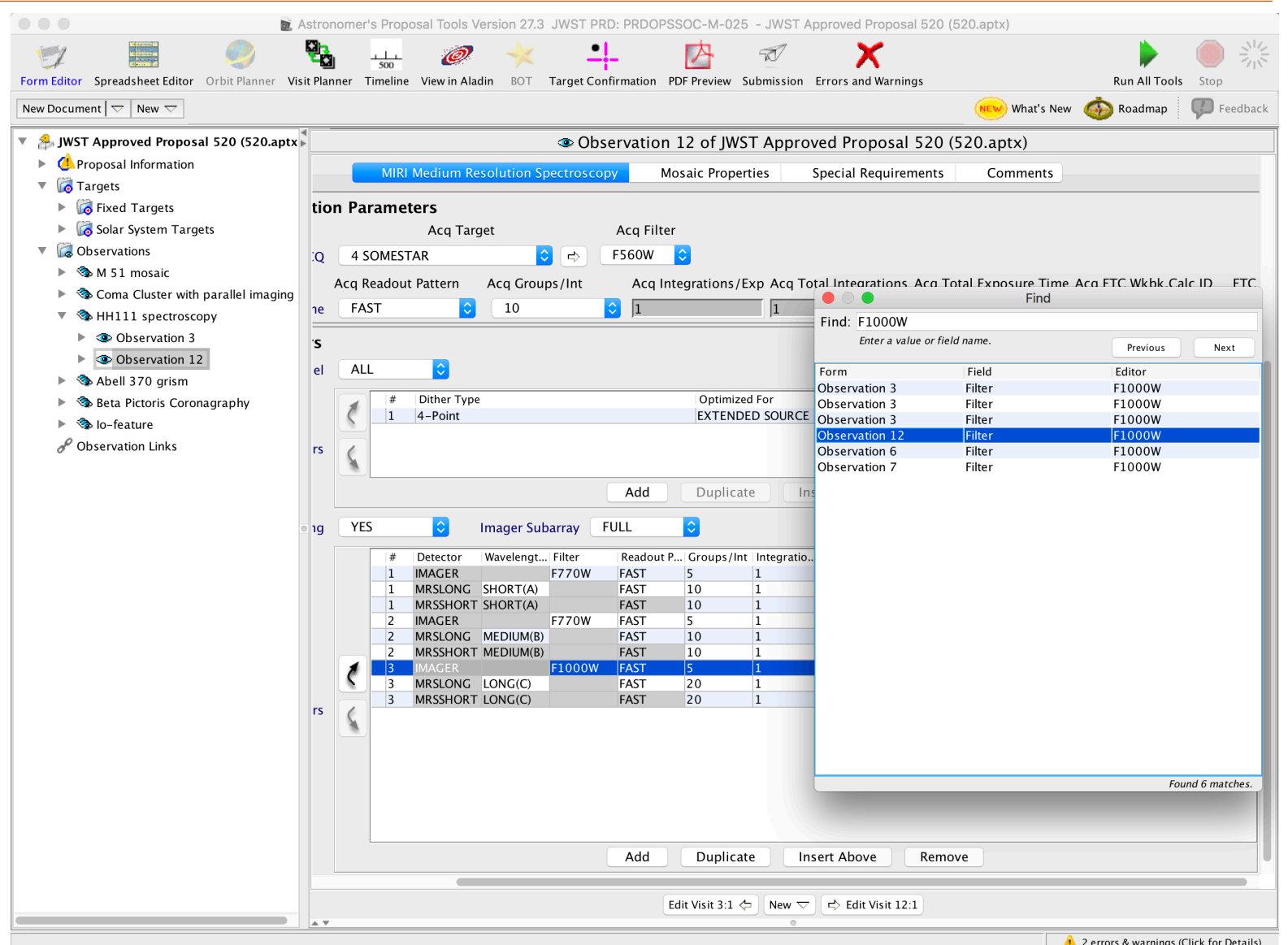


# Other Useful APT Capabilities – Find



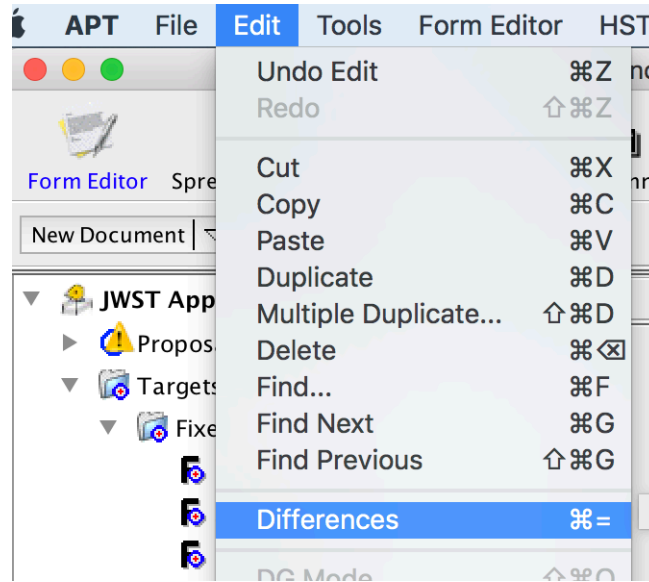
Find – can search on any part of the APT file (proposal info, target, observation, etc.)

Ex. find filter F1000W





# Other Useful APT Capabilities – Differences



The screenshot shows the APT software interface with the 'Differences' dialog box open. The dialog box displays the 'Target Acquisition Parameters' and 'MRS Parameters' for Observation 12 of JWST Approved Proposal 520. The 'Differences' dialog box is highlighted in yellow. Below the dialog box, the 'Diagnostic Browser' window is open, showing a list of differences between Observation 3 and Observation 12. The 'Diagnostic Browser' window is also highlighted in yellow.

Element	Severity	Source	Description
Observation 3			
Visit 3:1			
Observation 12			
Visit 12:1			
	Difference	Differences	Observation Number was changed from 3 in Observation 3 to 12 in Observation 12
	Difference	Differences	JwstMosaicTile Visits was changed from [3:1] in Observation 3 to [12:1] in Observation 12
	Difference	Differences	JWST Exposure Filter was changed from F1000W in Observation 3 to F770W in Observatio...
	Difference	Differences	JWST Exposure Filter was changed from F1000W in Observation 3 to F770W in Observatio...
	Difference	Differences	JWST Exposure Filter was changed from F1000W in Observation 3 to F770W in Observatio...

**Difference (Differences) Observation Number was changed from 3 in Observation 3 to 12 in Observation 12**

Differences – can difference two separate proposals, or on any part of the APT file (two parts of proposal info, two targets, two observations, etc.)

Ex. Difference two observations



# APT Overheads and Smart Accounting

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## APT Overheads

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- **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. (Covered below.)

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



## APT Overheads, continued

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- **Direct overheads – activities directly associated with an observing program**
    - major slews
    - mechanism motion times
    - guide star acquisition times
    - small angle maneuvers
    - target acquisitions
  - **Indirect overheads – activities performed for the general support of science observations (16%)**
    - calibrations
    - momentum management
    - wavefront sensing and control
    - other observatory maintenance activities
  - **Instrument overheads – activities directly associated with each instrument**
    - Filter/grating changes
    - detector readout
    - Instrument operations script compilation time
- Additional Resource:
- [JDox Article: JWST Overheads and Time Accounting Overview](#)



## APT Overheads, continued

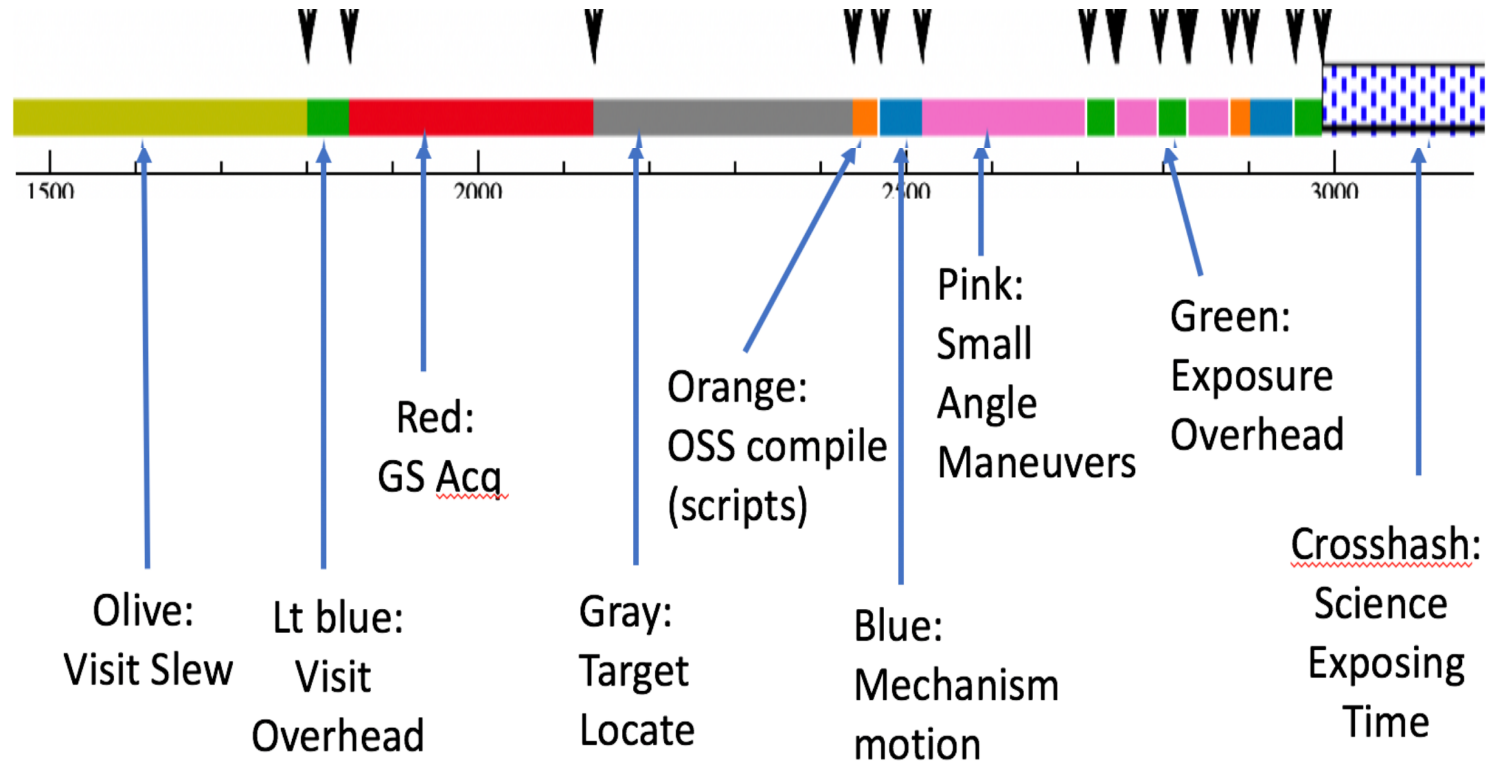
---

- Many overheads are known from ground testing, and can be applied deterministically (those occurring within a visit)
  - mechanism motions (filter or grating wheel rotations, other setup activities).
  - Small Angle Maneuvers (SAMs) (e.g., motions between dither steps or mosaic tiles).
  - target acquisition time (when needed).
- Statistical time estimates – assumed average time of activities that depend on the exact sequence of events when scheduled.
  - Ex: Initial slew time from previous observation to the first visit of your observation cannot be known by APT.
  - Scheduling studies indicate an average initial slew time of 1800 s.
  - This is charged once per observation, but see below (Smart Accounting)
- Some overheads are combinations!
  - Guide star acquisition time assumed includes a statistical estimate of how often initial failures and retries will need to be executed.
  - But then this fixed time is charged to each visit.



# 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:

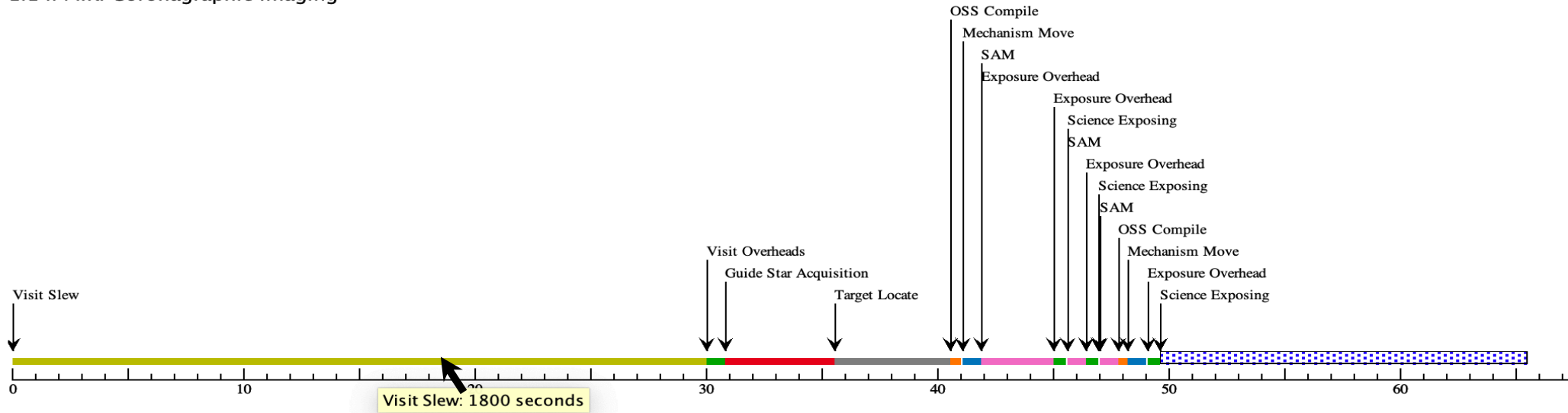
- [JDox Article: APT Graphical Timeline](#)
- [YouTube Video Tutorial: APT Graphical Timeline](#)



# APT Graphical Timeline Examples

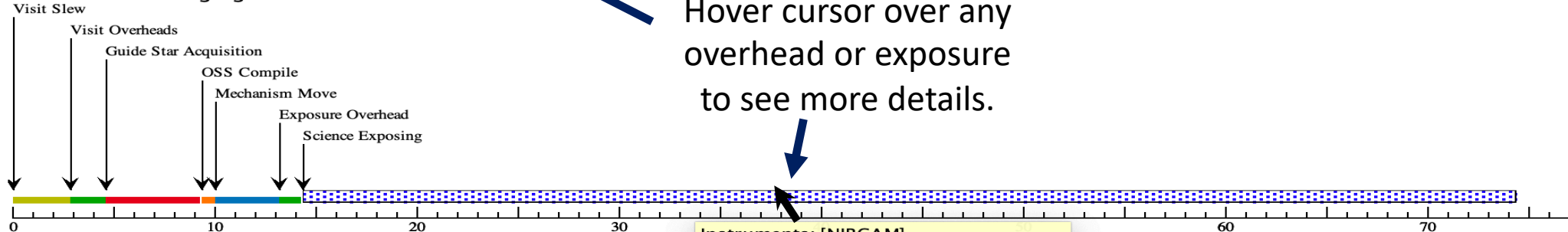
Initial visit,  
relatively short  
science exposure;  
overheads  
dominate

1:1 :: MIRI Coronagraphic Imaging



A second visit,  
relatively fewer  
overheads, long  
science exposure

1:2 :: NIRCam Imaging



Hover cursor over any  
overhead or exposure  
to see more details.

Instruments: [NIRCAM]  
Science Exposing: 3608 seconds  
● NIRCAM [F115W, F277W] /FULL





# 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.

Visit level

	Science	Instrument Overheads	Slew	Observatory Overheads	Direct Scheduling Overheads	Total Charged
Visit Duration (secs)	1794	1296	1800	783	0	5673
Data Volume	546 MB					

Observation level

	Science	Total Charged
Duration (secs)	1794	5673
Data Volume	546 MB	

Total for proposal

Science Time (hours)	1.37
Charged Time (hours)	4.06
Data Volume (MB)	3822.32
Allocated Time (hours)	10.00



## Considerations for Minimizing Overheads

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- Most large overheads are charged to visits and observations.
- Look for opportunities to reduce the number of visits, which reduces guide star acquisitions charges.
  - APT makes visits, so be aware of the Visit Splitting Distance.
  - Ex: Adjusting tile spacing on mosaics (as seen earlier).
  - Ex: Consider impact of dither selection.
- Don't specify "unnecessary" observations.
  - Seems obvious, but it is easy to do if you are not paying attention!
  - Ex: Observing same target with multiple filters; If you naively put each filter exposure in a separate observation, it gets expensive quickly.
    - Each observation incurs 1800 s initial slew charge.



## APT Overhead Charge Corrections (Smart Accounting)

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- 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.

- From a button right on the Proposal Information page.

The screenshot displays the APT Proposal Information page for JWST Approved Proposal 6 (Mosaics\_key.aptx). The interface includes a top toolbar with various tools like Form Editor, Spreadsheet Editor, Orbit Planner, and Submission. The left sidebar shows a tree view of the proposal structure, including Proposal Information, Targets, and Observations. The main content area displays the following details:

- Title:** Mosaic Use Case Examples
- Abstract:** This program uses M83 and M82 as a 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 (with options for Calibration and Treasury)
- Pure Parallel Proposal:**
- Cycle:** 1
- Science Time (hours):** 4.14
- Charged Time (hours):** 48.75 (highlighted in a yellow box)
- Data Volume (MB):** 57395.80
- Allocated Time (hours):** 50.00
- Proposal Size:** MEDIUM

A yellow box highlights the 'Charged Time (hours)' field (48.75) and a 'Run Smart Accounting' button. At the bottom of the page, there are buttons for '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.

- From 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.

The screenshot displays the APT software interface. The top toolbar includes various tools 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. The main window shows a tree view on the left with a selected folder 'Observations'. The central area features a zoomed-in view of observation scheduling with a timeline and a list of observations. At the bottom, there are buttons for 'Update Display' and 'Run Smart Accounting', both highlighted in yellow. A blue arrow points from the text in the list to the 'Update Display' button.


Visit	Status	Science	Instrument...	Slew	Observato...	Direct Sche...	Total Char...	Data Volume



## 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

After Smart Accounting Run

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

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

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



## APT Science Time and Total Charged Time -- Summary

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*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!***

- This is an important point to communicate in your own workshops.



## 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.

parameters

Subarray	FULL	
	Dither Type	No. Spectral St
Dither	MAPPING	5





# Thanks for Listening – Questions?

The screenshot shows the Astronomer's Proposal Tools (APT) Version 27.3 application window. The title bar reads "APT" and "Astronomer's Proposal Tools Version 27.3". The menu bar includes "File", "Edit", "Tools", "About", "HST Help", and "JWST Help". The toolbar contains icons for "Form Editor", "Spreadsheet Editor", "Orbit Planner", "Visit Planner", "Timeline", "View in Aladin", "BOT", "Target Confirmation", "PDF Preview", "Submission", "Errors and Warnings", and "Stop". A "New Document" menu is open, showing "New HST Proposal" and "New JWST Proposal" (highlighted in blue). A tooltip "Create a new JWST Proposal" is visible over the "New JWST Proposal" option. The main content area displays the title "Astronomer's Proposal Tools Version 27.3" and a list of acknowledgments:

- 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.
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- This product includes software developed by the Apache Software Foundation (<http://www.apache.org/>).

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At the bottom right, there is a "Show:" dropdown menu and a status bar indicating "No errors & warnings (Click for Details)".