

APT – Special Requirements

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Special Requirements – Overview

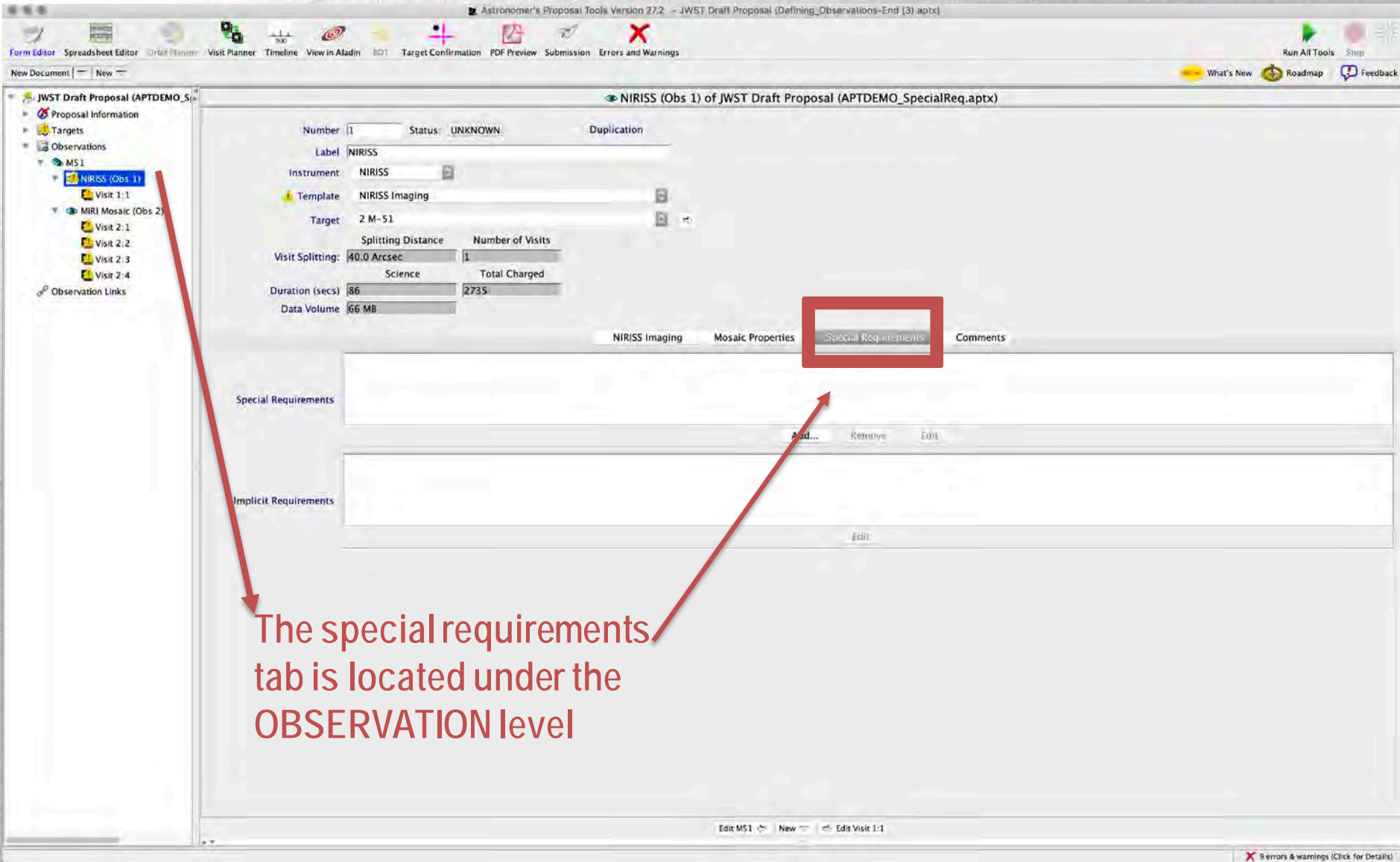
- General Special Requirements (e.g. Guiding, Target Position) are generally used to restrict the scheduling of JWST observations by various constraints. The Astronomer's Proposal Tool (APT) is used to enter the requirements into the proposal.
- Most general special requirements directly or indirectly restrict the times when observations (and/or their component visits) can be scheduled. These should be used to provide the schedulers at STScI with enough constraints to ensure that the observations are properly scheduled. Special requirements should not be used unless necessary to accomplish the scientific objectives of the proposal.
- For further information on the special requirements for JWST see our J-Dox page entitled: **APT Special Requirements**

<https://jwst-docs.stsci.edu/jwst-astronomers-proposal-tool-overview/apt-workflow-articles/apt-special-requirements#APTSpecialRequirements-TimingSRs>

Special Requirements – General Information

- There are two types of special requirements: Implicit and Explicit
 - Implicit requirements are automatically generated for observations with multiple visits (like mosaics)
 - 53 day requirement is the longest the target stays in a field of regard for the worst case Dec.
 - Visits Same PA.
 - Cannot be deleted but they can be edited.
 - Explicit Requirements are user specified (This is the majority of what will be discussed in this section of the workshop)
- Special requirements apply to all visits within the observation they are placed on.
- APT will automatically look for illegal or inconsistent requirements.

Special Requirements Location in APT



The screenshot displays the Astronomer's Proposal Tools (APT) interface. The main window is titled "NIRISS (Obs 1) of JWST Draft Proposal (APTDEMO_SpecialReq.aptx)". The left sidebar shows a tree view of the proposal structure, with "NIRISS (Obs 1)" selected. The main panel shows the observation details, including the instrument (NIRISS), template (NIRISS Imaging), target (2 M-51), and duration (86 seconds). The "Special Requirements" tab is highlighted with a red box. Below the tab, there are sections for "Special Requirements" and "Implicit Requirements".

Number: 1 Status: UNKNOWN Duplication

Label: NIRISS

Instrument: NIRISS

Template: NIRISS Imaging

Target: 2 M-51

Splitting Distance: 40.0 Arcsec Number of Visits: 1

Visit Splitting: Science: 86 Total Charged: 2735

Duration (secs): 86 Data Volume: 66 MB

Special Requirements

Implicit Requirements

Special Requirements

Implicit Requirements

Add... Remove Edit

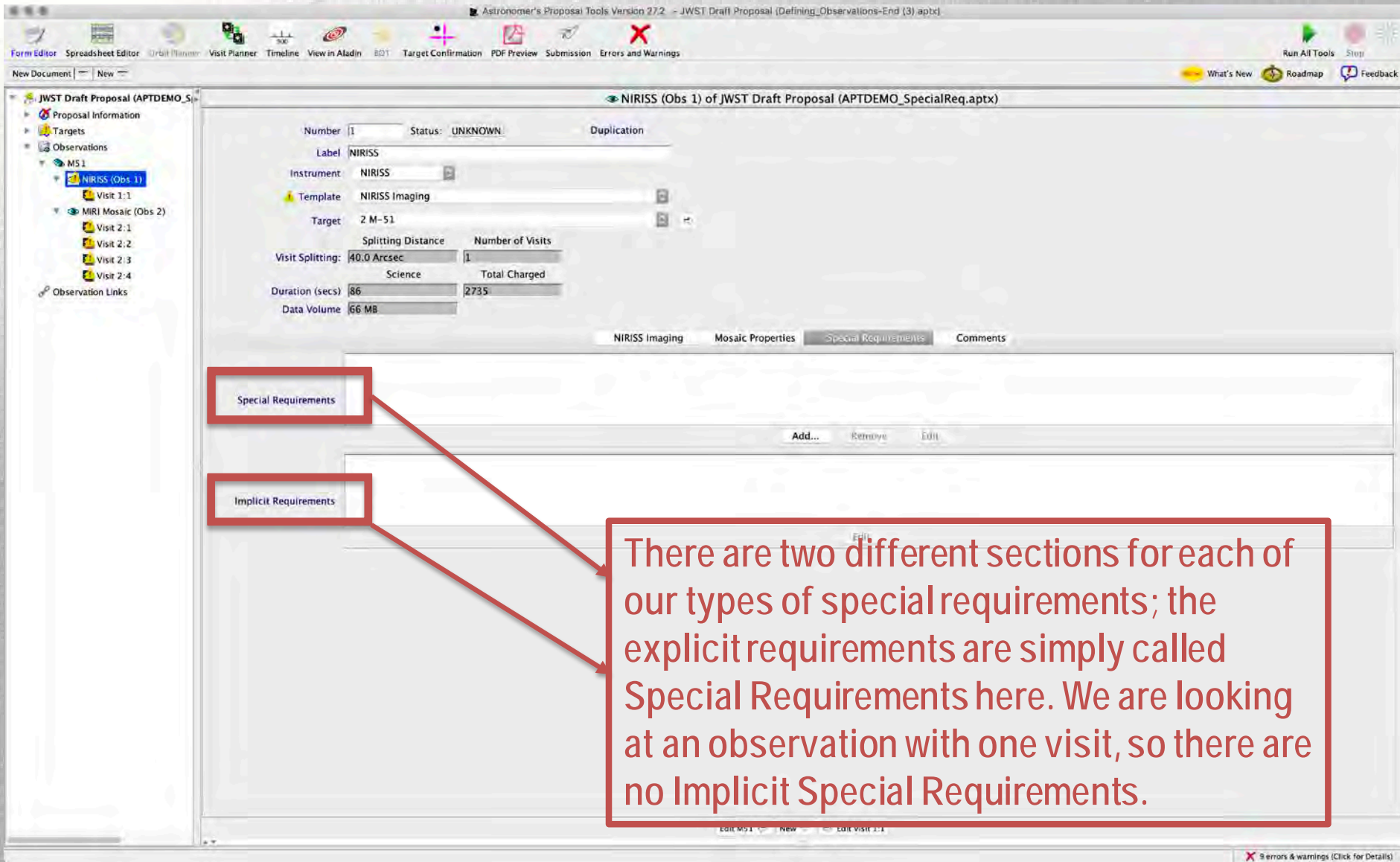
Edit

Edit M51 New Edit Visit 1:1

9 errors & warnings (Click for Details)

The special requirements tab is located under the OBSERVATION level

Special Requirements Location in APT



Astronomer's Proposal Tools Version 27.2 - JWST Draft Proposal (Defining_Observations-End (3).aptx)

Form Editor | Spreadsheet Editor | Orbit Planner | Visit Planner | Timeline | View in Aladin | EDT | Target Confirmation | PDF Preview | Submission | Errors and Warnings

New Document | New

JWST Draft Proposal (APTDEMO_S... | NIRISS (Obs 1) of JWST Draft Proposal (APTDEMO_SpecialReq.aptx)

Number: 1 | Status: UNKNOWN | Duplication

Label: NIRISS

Instrument: NIRISS

Template: NIRISS Imaging

Target: 2 M-51

Splitting Distance: 40.0 Arcsec | Number of Visits: 1

Visit Splitting:	Science	Total Charged
Duration (secs)	86	2735
Data Volume	66 MB	

NIRISS Imaging | Mosaic Properties | **Special Requirements** | Comments

Special Requirements

Implicit Requirements

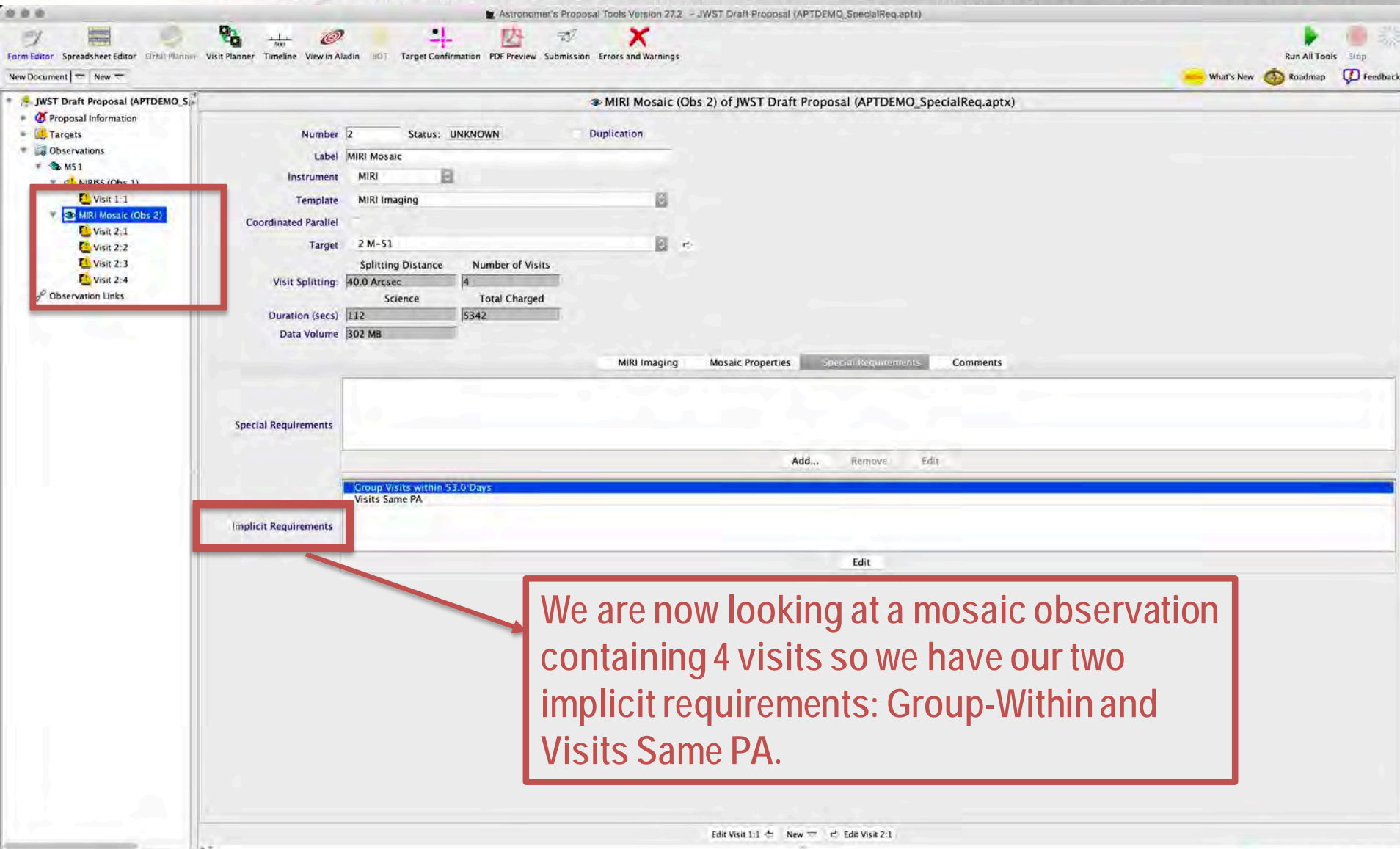
Add... | Remove | Edit

There are two different sections for each of our types of special requirements; the explicit requirements are simply called Special Requirements here. We are looking at an observation with one visit, so there are no Implicit Special Requirements.

Edit M-51 | New | Edit Visit 2.1

9 errors & warnings. (Click for Details)

Implicit Requirements



The screenshot shows the 'Astronomer's Proposal Tools Version 27.2' interface for a 'JWST Draft Proposal (APTDEMO_SpecialReq.aptx)'. The main window displays details for 'MIRI Mosaic (Obs 2)'. The left sidebar shows a tree view with 'MIRI Mosaic (Obs 2)' selected. The main panel shows the following details:

- Number: 2, Status: UNKNOWN, Duplication:
- Label: MIRI Mosaic
- Instrument: MIRI
- Template: MIRI Imaging
- Coordinated Parallel: [empty]
- Target: 2 M-51
- Splitting Distance: 40.0 Arcsec, Number of Visits: 4
- Visit Splitting: Science: 112, Total Charged: 5342
- Duration (secs): 112, Data Volume: 302 MB

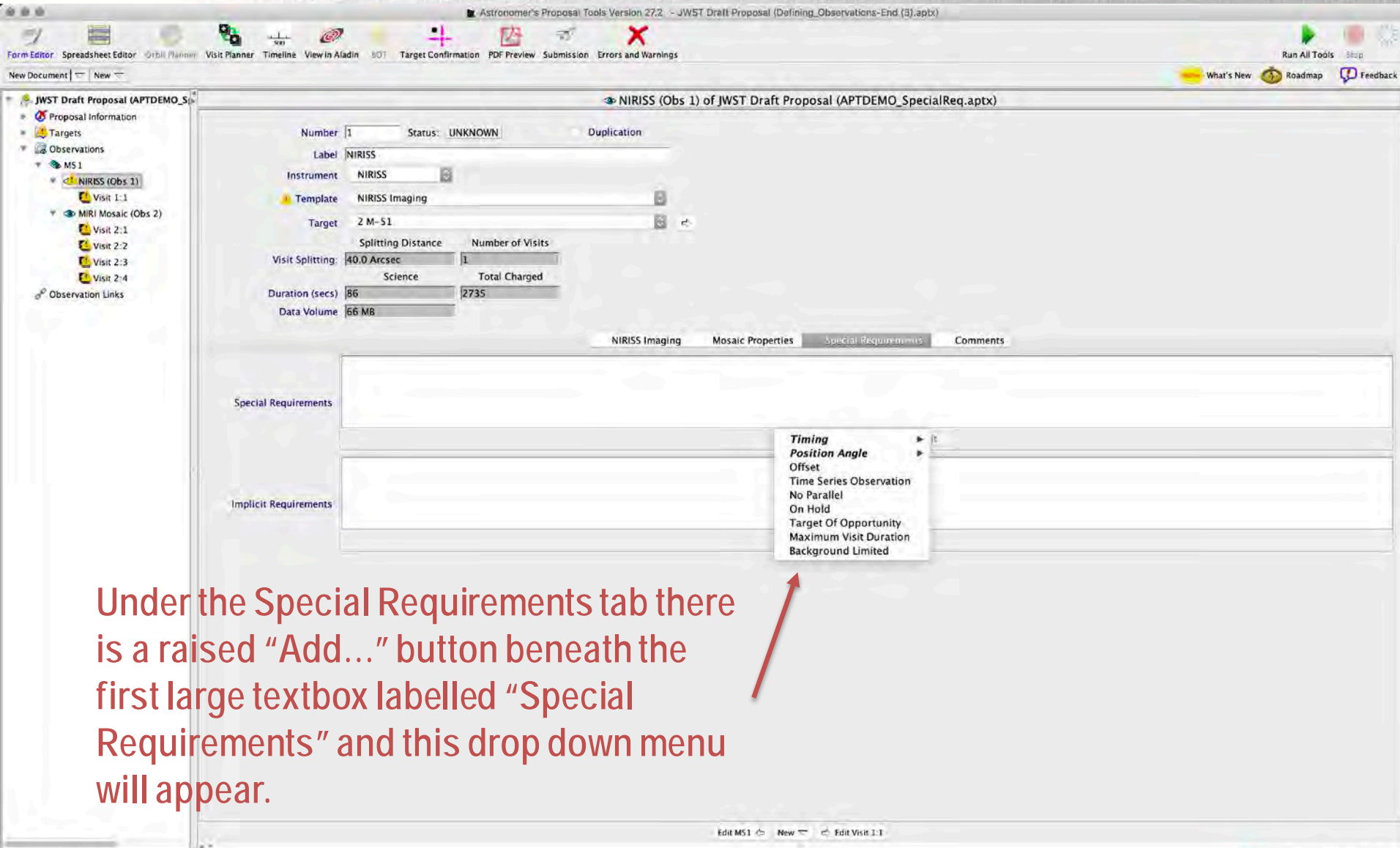
Below the details are tabs for 'MIRI Imaging', 'Mosaic Properties', 'Special Requirements', and 'Comments'. The 'Special Requirements' section is currently empty. Below it, a table of implicit requirements is visible:

Implicit Requirements
Group Visits within 53.0 Days
Visits Same PA

An arrow points from the 'Implicit Requirements' label to a text box explaining the requirements.

We are now looking at a mosaic observation containing 4 visits so we have our two implicit requirements: Group-Within and Visits Same PA.

How to add Explicit Special Requirements



Number: 1 Status: UNKNOWN Duplication

Label: NIRISS

Instrument: NIRISS

Template: NIRISS Imaging

Target: 2 M-51

Splitting Distance	Number of Visits
40.0 Arcsec	1

Duration (secs)	Science	Total Charged
86		2735

Data Volume: 66 MB

Special Requirements

Implicit Requirements

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

9 errors & warnings (Click for Details)

Under the Special Requirements tab there is a raised "Add..." button beneath the first large textbox labelled "Special Requirements" and this drop down menu will appear.

Types of Explicit Special Requirements

1. Timing
2. Position Angle
3. Solar System
4. Offset
5. Time Series Observation
6. No Parallel
7. On Hold
8. ToO and Response Time
9. Maximum Visit Duration
10. Background Limited

Types of Explicit Special Requirements


1. Timing
2. Position Angle
3. Solar System ←
4. Offset
5. Time Series Observation
6. No Parallel
7. On Hold
8. ToO and Response Time
9. Maximum Visit Duration
10. Background Limited

Solar System Objects have their own default requirements that can be edited or deleted

This option will only appear if you are working with a solar system object as your defined target for that observation.

J-dox: <https://wst-docs.stsci.edu/jppom/special-requirements/solar-system-special-requirements>

Types of Explicit Special Requirements

1. Timing
2. Position Angle
3. Solar System
4. Offset 
5. Time Series Observation
6. No Parallel
7. On Hold
8. ToO and Response Time
9. Maximum Visit Duration
10. Background Limited

Offset requirement is the same as POS TARG for HST. This allows for the placement of a target at a position away from the fiducial point of aperture (arcsec units).

J-Dox: <https://jwst-docs.stsci.edu/jwst-observatory-functionality/jwst-position-angles-ranges-and-offsets>

Offset Special Requirement in APT



APT Special Requirements drop down menu view



Offset units are in arcsec. Proposer must indicate an offset in the X and Y directions

Types of Explicit Special Requirements

1. Timing
2. Position Angle
3. Solar System
4. Offset
5. Time Series Observation ←
6. No Parallel
7. On Hold
8. ToO and Response Time
9. Maximum Visit Duration
10. Background Limited

Time Series Observation requirement time-variable observations (like brown dwarfs and transiting exoplanets) and the NO PARALLEL requirement must be used in conjunction

J-Dox: <https://jwst-docs.stsci.edu/methods-and-roadmaps/jwst-time-series-observations>

Timing	▶
Position Angle	▶
Offset	
Time Series Observation	
No Parallel	
On Hold	
Target Of Opportunity	
Maximum Visit Duration	
Background Limited	

This requirement has no additional input by the proposer.

Types of Explicit Special Requirements

1. Timing
2. Position Angle
3. Solar System
4. Offset
5. Time Series Observation
6. No Parallel ←
7. On Hold
8. ToO and Response Time
9. Maximum Visit Duration
10. Background Limited

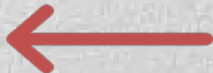
No Parallel requirement specifies that the current observation should not be allowed to have any parallel observations attached to it.

J-Dox: <https://jwst-docs.stsci.edu/jppom/special-requirements/general-special-requirements#GeneralSpecialRequirements-NoPar>



This requirement has no additional input by the proposer.

Types of Explicit Special Requirements

1. Timing
2. Position Angle
3. Solar System
4. Offset
5. Time Series Observation
6. No Parallel
7. On Hold 
8. ToO and Response Time
9. Maximum Visit Duration
10. Background Limited

On Hold requirement is used to indicate that the observation can't be made until some other activity happens first (pre-images like for NIRSpec multi object spectroscopy)

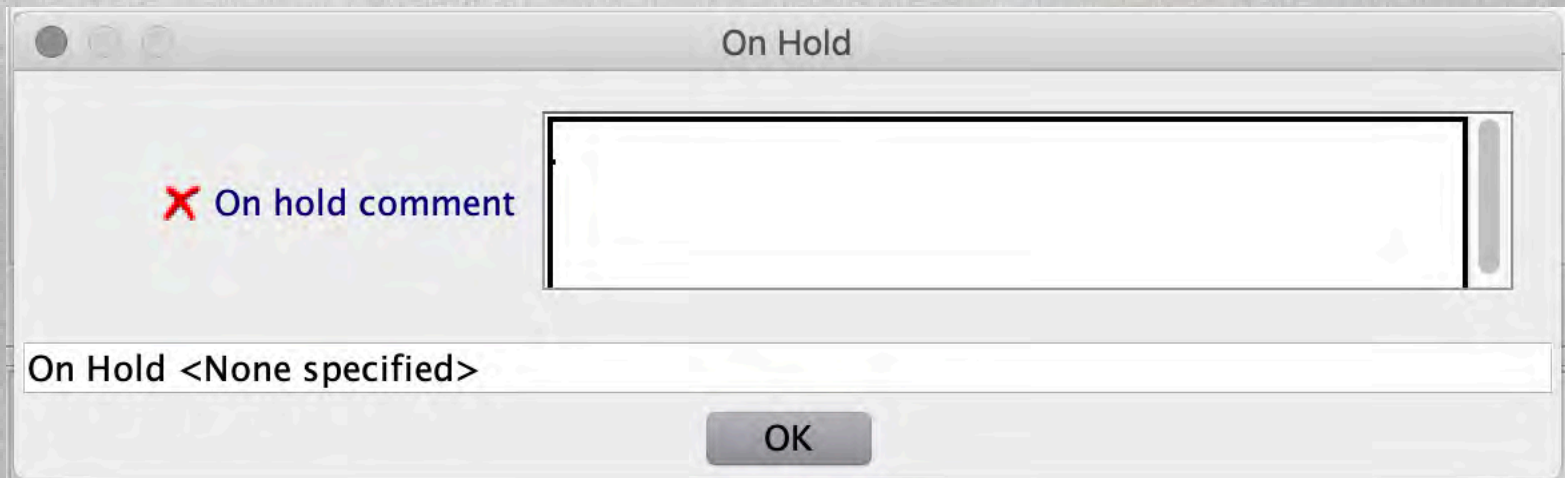
J-Dox: <https://jwst-docs.stsci.edu/jwst-astronomers-proposal-tool-overview/apt-workflow-articles/apt-special-requirements#APTSpecialRequirements-GeneralormiscellaneousSRs>

On Hold Special Requirement in APT



APT Special Requirements drop down menu view

An explanation as to why you are placing a visit on hold is required.



Types of Explicit Special Requirements

1. Timing
2. Position Angle
3. Solar System
4. Offset
5. Time Series Observation
6. No Parallel
7. On Hold
8. ToO and Response Time
9. Maximum Visit Duration
10. Background Limited




ToO and response time requirement dictates the turn around time for the observation. As a note: the absolute minimum response time is 24 hours and ANYTHING less than 14 days is considered disruptive

Target of Opportunity and Response Time Special Requirement in APT

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

APT Special Requirements drop down menu view

Target Of Opportunity

 Response time Days

Target Of Opportunity response time <None specified>

OK

Proposer must note the response time. An Implicit "On Hold" Special Requirement is also created with ToO.

Types of Explicit Special Requirements

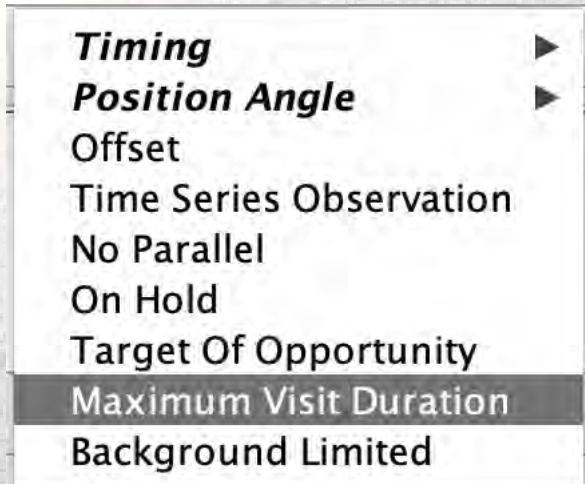
1. Timing
2. Position Angle
3. Solar System
4. Offset
5. Time Series Observation
6. No Parallel
7. On Hold
8. ToO and Response Time
9. Maximum Visit Duration
10. Background Limited



The Maximum Visit Duration requirement default is 24 hours but can be reduced to increase schedulability.

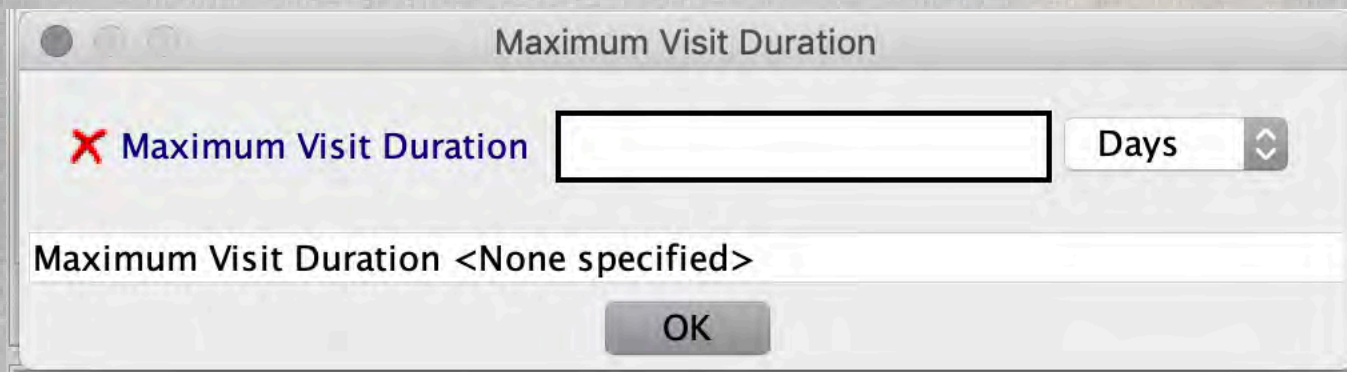
J-Dox: <https://jwst-docs.stsci.edu/jppom/special-requirements/general-special-requirements>

Maximum Visit Duration Special Requirement in APT



APT Special Requirements drop down menu view

Proposer must indicate the duration in sec, min, hours or days



Types of Explicit Special Requirements

1. Timing
2. Position Angle
3. Solar System
4. Offset
5. Time Series Observation
6. No Parallel
7. On Hold
8. ToO and Response Time
9. Maximum Visit Duration
10. Background Limited ←

Background limited requirement is the percentage of background noise that will be tolerated.

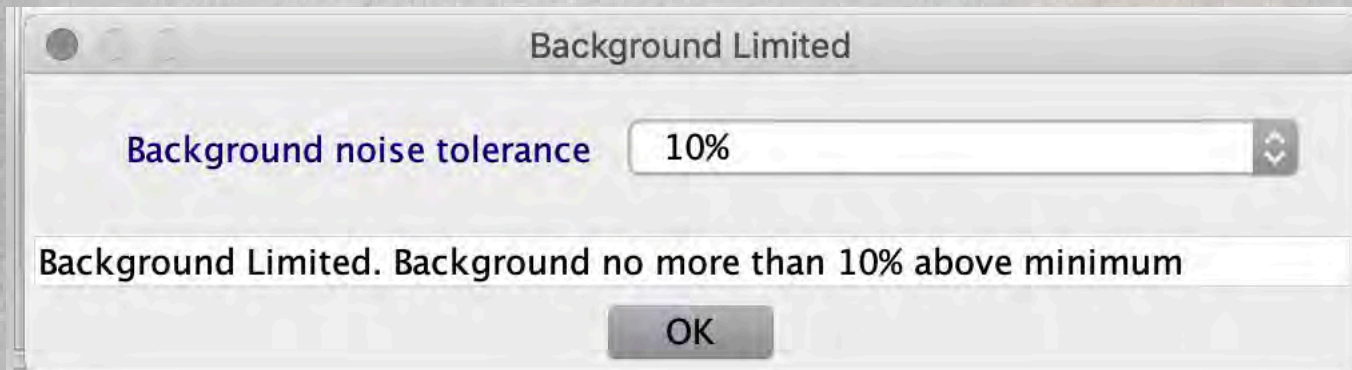
J-Dox: <https://jwst-docs.stsci.edu/jwst-observatory-functionality/jwst-background-model/background-limited-observations>

Background Limited Special Requirement in APT

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

APT Special Requirements drop down menu view

Proposer must indicate the percentage of background that will be tolerated: 10%, 20%, 40%, or 80%



Background Limited

Background noise tolerance 10%

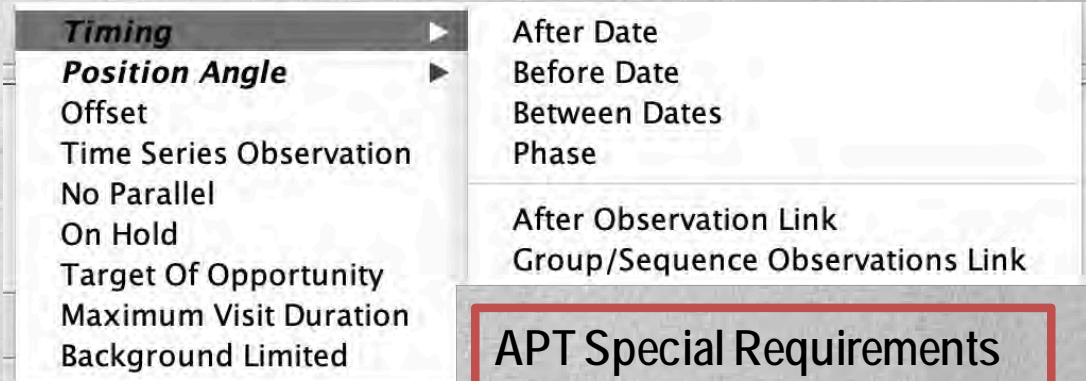
Background Limited. Background no more than 10% above minimum

OK

Explicit Special Requirement – Timing

- Timing requirements include dates & phase :

- After Date
- Before Date
- Between Dates
- Phase range
 - Period
 - Zero-Phase



The screenshot shows a drop-down menu with the following items:

- Timing** (header)
- Position Angle** (header)
- Offset
- Time Series Observation
- No Parallel
- On Hold
- Target Of Opportunity
- Maximum Visit Duration
- Background Limited

The 'Timing' header is expanded to show a sub-menu with the following items:


- After Date
- Before Date
- Between Dates
- Phase
- After Observation Link
- Group/Sequence Observations Link

APT Special Requirements drop down menu view; links will be explained later.

J-Dox: <https://jwst-docs.stsci.edu/jppom/special-requirements/timing-special-requirements>

Explicit Special Requirement – Timing

- Timing requirements include dates & phase :

- After Date
 - Before Date
 - Between Dates
 - Phase Range
 - Period
 - Zero-Phase
- 

These are the same requirements that exist for HST. Observation to occur after a certain date, before a certain date and between two specific dates

Date Special Requirements in APT

After Date

Legal date formats: DD-MMM-YYYY:hh:mm:ss or YYYY.DDD:hh:mm:ss

✗ After date

After Date <None specified>

OK

Before Date

Legal date formats: DD-MMM-YYYY:hh:mm:ss or YYYY.DDD:hh:mm:ss

✗ Before date

Before Date <None specified>

OK

Between Dates

Legal date formats: DD-MMM-YYYY:hh:mm:ss or YYYY.DDD:hh:mm:ss

✗ After date

✗ Before date

Between Dates <None specified> and <None specified>

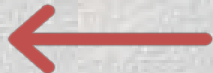
OK

Proposer is required to input dates either by typing in dates in the listed formats or by using the calendar built in interface. Seen here:

December 2019

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
49	1	2	3	4	5	6	7
50	8	9	10	11	12	13	14
51	15	16	17	18	19	20	21
52	22	23	24	25	26	27	28
01	29	30	31				

Explicit Special Requirement – Timing

- Timing requirements include dates & phase :
 - After Date
 - Before Date
 - Between Date
 - Phase Range 
 - Period
 - Zero-Phase

The phase range is the range in which the first science activity begins and must be between 0 and 1.

Explicit Special Requirement – Timing

- Timing requirements include dates & phase :
 - After Date
 - Before Date
 - Between Date
 - Phase Range
 - Period ←
 - Zero-Phase

Period is the duration of the PHASE and the minimum is 5 mins.

J-Dox: <https://jwst-docs.stsci.edu/jppom/special-requirements/timing-special-requirements#TimingSpecialRequirements-Phase>

Phase Range Example

We want to observe an exoplanet transiting V-AU-MIC-1.

We know the PERIOD to be ~8.5 days

We want the ZERO-PHASE to ensure that the START is at the end of the transit: 2458330.3915026

We want the observation to begin at the END of the PERIOD to capture the entire transit so the PHASE RANGE is 0.98695 to 0.991875

Phase

Phase constrains the start of the first science exposure of each visit.

Phase range to

Period Days

Zero phase (HJD)

Phase 0.98695 to 0.991875 with period 8.5 Days and zero-phase 2458330.3815026 HJD

Explicit Special Requirement – Timing

- Timing requirements include dates & phase :
 - After Date
 - Before Date
 - Between Date
 - Phase Range
 - Period
 - Zero-Phase ←

Zero phase is the date of the zero-phase with respect to the sun.

Phase Range Special Requirement in APT

Phase

Phase constrains the start of the first science exposure of each visit.

Phase range to

Period Days

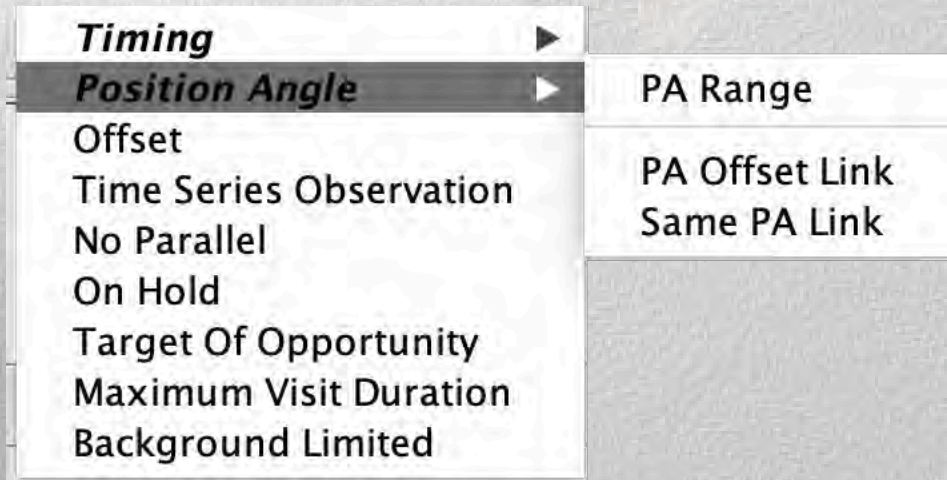
Zero phase (HJD)

Phase <None specified> to <None specified> with period <None specified> and zero-phase <None specified> HJD

Phase Range, Period and Zero-Phase requirements are all entered into the same window under "Phase" option in APT Special Requirements drop down menu.

Explicit Special Requirement – Position Angle

- The Position Angle Special Requirements are as follows:
 - Position Angle ranges
 - The angle is between 0 - 360



APT Special Requirements drop down menu view; links will be mentioned later

J-Dox: <https://jwst-docs.stsci.edu/jppom/special-requirements/aperture-position-angle-special-requirements>

Explicit Special Requirement – Position Angle

- The Position Angle Special Requirements are as follows:

- Position Angle ranges 
 - The angle is between 0 - 360

Position Angle can be a range, or multiple ranges but they cannot overlap.

If you need to cross through zero, you need to list the angles accordingly (e.g. 90-180 \neq 180-90)

Explicit Special Requirement – Position Angle

- The Position Angle Special Requirements are as follows:
 - Position Angle ranges
 - The angle is between 0 - 360

Position Angle is measured NORTH through EAST.

Position Angle Special Requirement in APT

PA Range

X Aperture PA Range to Degrees *V3 PA Range:* to Set using V3

Aperture PA Range <None specified> to <None specified> (V3 ? to ?)

OK

PA Range

X Aperture PA Range to Degrees *V3 PA Range:* to Set using V3

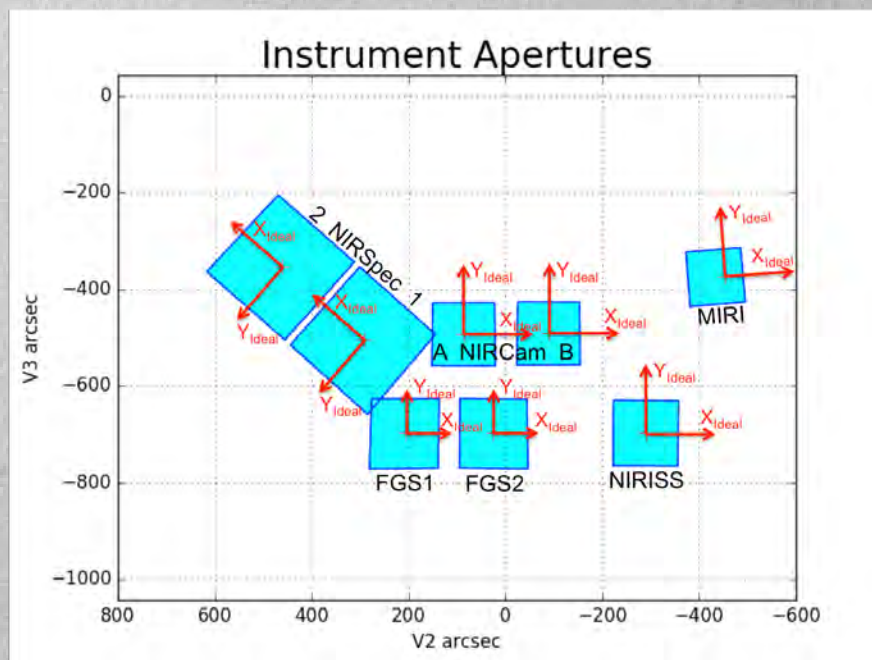
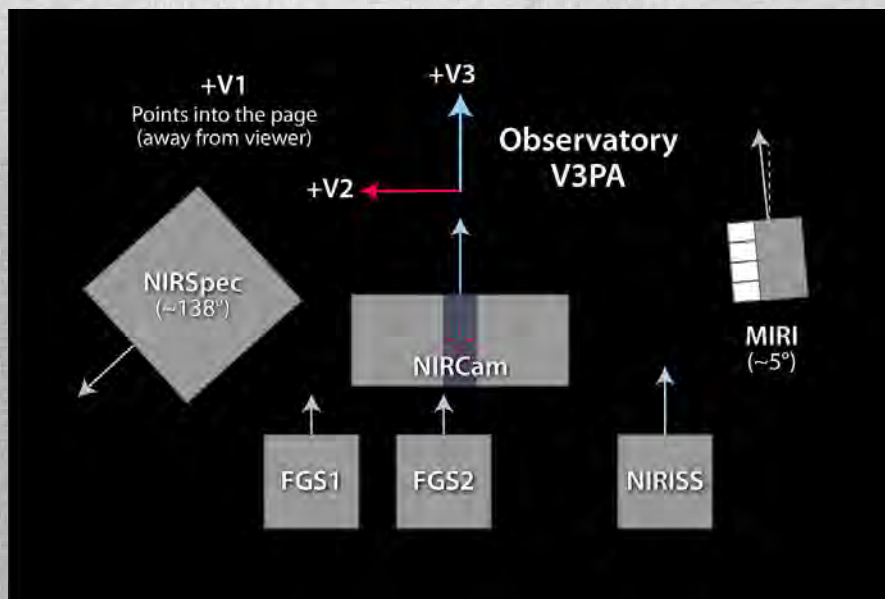
Aperture PA Range <None specified> to <None specified> (V3 ? to ?)

OK

Proposer is required to enter an exact PA or PA range in either V3 or Aperture PA.

Differences between V3 and Aperture Position Angle

- V3 Position Angle is the overall angle of the whole of JWST
- Aperture Position Angle is dependent upon the instrument you are using:
 - NIRCAM, NIRISS: V3 PA \approx Aperture PA
 - NIRSpec $\sim 138^\circ$ difference between V3 PA and Aperture PA
 - MIRI $\sim 5^\circ$ difference between V3 PA and Aperture PA



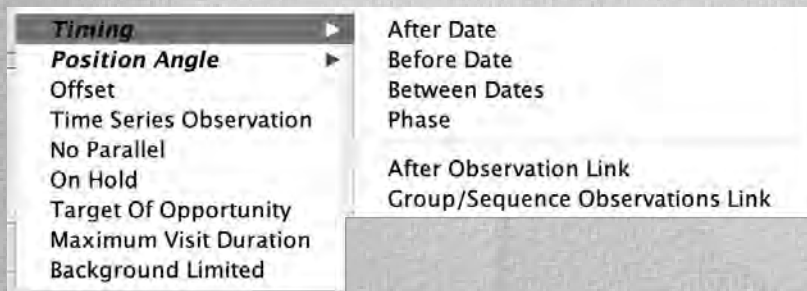
J-Dox: <https://jwst-docs.stsci.edu/jwst-observatory-hardware/jwst-observatory-coordinate-system-and-field-of-regard#JWSTObservatoryCoordinateSystemandFieldofRegard-JWSTObservatorycoordinatesystem>

Explicit Special Requirement – Links

- There are two ways to add links to your program: in the observations link item in the tree editor or in the observations special requirements section.
- Two types of links:
 1. Timing
 2. Position Angle

Explicit Special Requirement – Links

- There are two ways to add links to your program: in the observations link item in the tree editor or in the observations special requirements section.
- Two types of links:
 1. Timing ←
 2. Position Angle



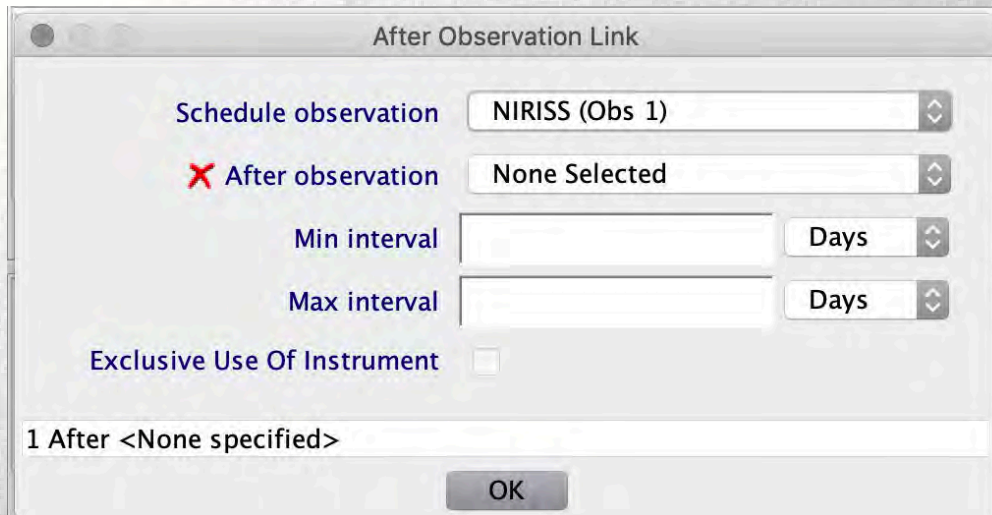
After Observation Link

- Scheduling one observation to follow another observation within an interval of time

Group/Sequence

- If you **GROUP OBSERVATIONS**, all visits of observations included in the observation list will execute in an order determined by the scheduling system
- If you **SEQUENCE OBSERVATIONS**, all visits of observations included in the observation list must be ordered according to their observation number

Timing Link Special Requirements in APT



After Observation Link

Schedule observation: NIRISS (Obs 1)

✗ After observation: None Selected

Min interval: [] Days

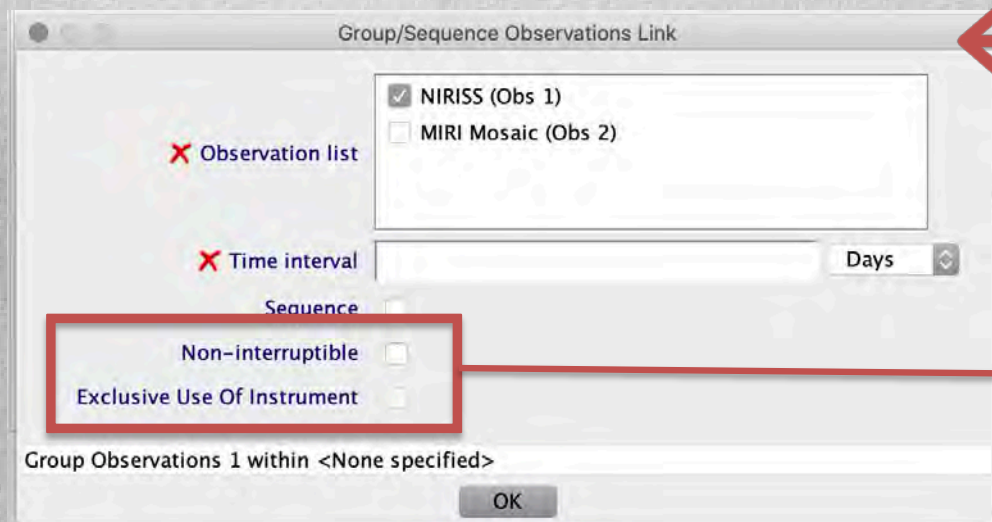
Max interval: [] Days

Exclusive Use Of Instrument:

1 After <None specified>

OK

After-Observation Link



Group/Sequence Observations Link

✗ Observation list: NIRISS (Obs 1), MIRI Mosaic (Obs 2)

✗ Time interval: [] Days

Sequence:

Non-interruptible:

Exclusive Use Of Instrument:

Group Observations 1 within <None specified>

OK

Group/Sequence Observation Link

If NON-INTERRUPTIBLE is selected, then all visits included must execute without interruption. (warning) The total duration of a non-interruptible group may not exceed 24 hours due to scheduling concerns.

EXCLUSIVE USE OF INSTRUMENT
This option is used to carry out an engineering procedure for a given instrument that requires two or more visits with a substantial time separation between the first and last. While the procedure is underway, no other visits using that instrument may be scheduled. An example is the NIRSpec MSA ANNEAL.

Explicit Special Requirement – Links

- There are two ways to add links to your program: in the observations link item in the tree editor or in the observations special requirements section.
- Two types of links:
 1. Timing
 2. Position Angle ←

Position Angle Offset Link

- Observation PA offset from another observation

Same Position Angle Link

- Two or more observations will execute at the same position angle



Position Angle Link Special Requirements in APT

PA Offset Link

Orient observation

Offset from

Min PA offset Degrees

Max PA offset Degrees

Reference axis

Aperture PA Offset 1 from <None specified>

OK

PA Offset Link

Same PA Link

Observation list

- NIRISS (Obs 1)
- MIRI Mosaic (Obs 2)

Reference axis

Same Aperture PA 1

OK

After-
Observation
Link