

# **JWST Astronomer's Proposal Tool (APT) for Solar System Observers**

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# Get APT Now (yes, right now...)

- Go to: [apt.stsci.edu](http://apt.stsci.edu)
  - Look in upper-right corner: Install APT 24.3 (current released version)
  - Pick your operating system
  - Go to Step 2 in the table, click link for “proceed to the installation”
  - Select your download
  - Start installer (system dependent)
  - Takes a few minutes for whole process

# What is APT?

- APT is your tool for
  - Designing JWST (and HST) observations
    - Defining targets
      - Standard targets: Planets, Dwarf Planets, Satellites, Longitudes, etc.
      - Comets, asteroids, new satellites
    - Defining scheduling constraints on observations
      - Date/time
      - Separation from another body
      - Apparent rate of motion
      - Phase angle, distance, etc.
    - Defining Observations
      - Pick Instrument (NIRCAM, NIRSpec, MIRI, NIRISS)
      - Pick Science Template (e.g. Imaging, IFU Spectroscopy, ...)
        - Optionally set up Target Acquisition
        - Define Exposure Specifications (filter and/or disperser plus detector readout parameters)
    - Evaluating schedulability of observations
    - Submitting your Proposals

***Java Application available at <http://apt.stsci.edu>***

# APT Limitations

- APT does not provide sensitivity information
  - The JWST ‘ETC’ (Exposure Time Calculator) will, but is not yet released and won’t specifically support moving targets.
- APT is not yet adequately documented for JWST
  - HST documentation is useful for common features (targets, proposal stuff)
  - JWST documentation is in preparation now
- APT is complex and will take time to learn
- APT can’t tell you everything
  - Read the manuals (when they become available)

# JWST APT: What's Missing (for now)

- Ephemeris visualization against all-sky images/catalogs
  - Has been added for HST, waiting for JWST port
  - Expected... Cycle 2?
- Observation visualization against all-sky images/catalogs
  - Have to use a fixed target to examine dithers, coverage, orientation, ...
  - Expected... Cycle 2?
- NIRSPec Target Acquisition for point sources
  - Will use 1.6" aperture for TA on moving targets
  - Can then put target in any fixed slit, IFU, MSA “long-slit”

# JWST APT Instruments & Templates

NIRCam: 0.6 – 5 um imager, slitless grisms,  
32 / 65 mas pixels (SW / LW)

## Imaging \*\*

Simultaneous 0.6-2.3 & 2.4-5.0 micron imaging  
Mapping (2.2' x 5' FOV)  
Bright extended sources (10'' – 1.1' FOV)

## Coronagraphy

~0.5" inner working angle

## Time Series \*\*

High-cadence, long duration photometry

## Grism Time Series \*\*

High-cadence, long duration slitless spectroscopy

## Grism Imaging

Wide-field slitless spectroscopy

NIRISS: 0.8 - 5 um imager & spectrometer

R = 150 0.8 – 2.2 um slitless spectra

R = 700 0.8 – 2.5 um slitless spectra

Imaging in 7 bands

## Aperture-masking Interferometry \*\*

2.6 – 5um, 65mas resolution

NIRSpec: 0.7 – 5 um spectrometer

R = 100, 1000, 2700

3 settings for full coverage at R > 100

## IFU Spectroscopy \*\*

3"x3" FOV, 100mas pixels

## Fixed Slits

0.2" & 0.4" x 3.8", 1.6"x1.6"

**Multi-shutter Array (Pseudo long-slit \*\*)**  
0.2" x 0.46" slitlets

MIRI: 5 - 28 um imager & spectrometer

R = 100 5 – 14 um slit spectra

## Imaging \*\*

9 bands

110 mas pixels

## IFU Spectroscopy \*\*

4"x4" FOV, 110mas pixels, R=2000

5 – 28 um (4 settings for full coverage)

## Fixed Slit \*\*

0.6" x 5.5", R=100, 5 – 14 um in one shot

\*\* Most useful for solar system observations

# JWST APT Observing Templates

- Instrument capabilities are organized into Templates
  - Templates are focused on particular science applications
  - An Observation is an instance of one Template
  - Observations using different instruments or different modes require completion of separate templates
  - Observations may be grouped, sequenced, time-constrained, etc.
- Template interfaces share many common features
  - Only choices related to specific science application are presented
  - Template structure reflects a logical work-flow for defining an observation
- Templates collect parameters needed to execute observations
  - Prevent users from making very bad choices (usually)
  - Result in reduced flexibility in some ways
  - Simplify planning, on-orbit operations (\$\$)

Basics

# **APT TUTORIAL**

# APT: Starting a Proposal

Astronomer's Proposal Tools Version 24.2 - JWST Draft Proposal (junk.aptx)

File Edit Tools Form Editor Help

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

New Document | New Co-I JWST What's New HST What's New Roadmap Feedback

**JWST Draft Proposal (junk.aptx)**

**Proposal Information**

**Title**   
**Abstract**

**Proposal ID**  **Category** GO  Calibration  Treasury

**Pure Parallel Proposal**

**Cycle** 1   Explain unschedulable observations  
 Request custom time allocation  
 Future cycles

**Science Time (hours)** 0.12  
**Charged Time (hours)** 0.46

**Proprietary Period** Default  Default is 12 Months  
**Allow Restricted**  (this session only)

**Scientific Category** None Selected   
**Science Keywords**   
Choose 2 to 5 science keywords.

**Alternate Category** None Selected  (Optional)  
 Coordinated telescopes

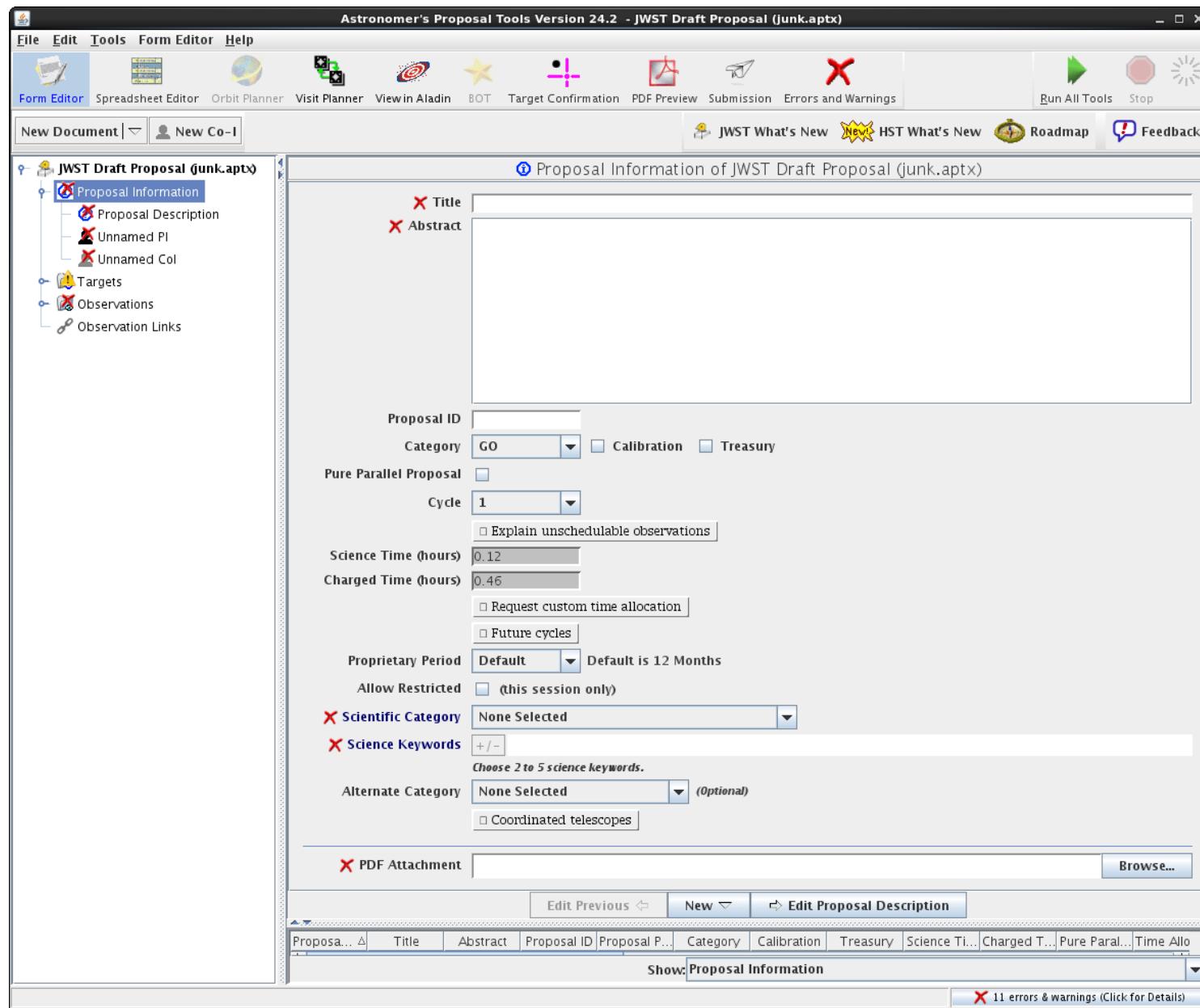
**PDF Attachment**

Edit Previous  New  Edit Proposal Description

Proposal... Title Abstract Proposal ID Proposal P... Category Calibration Treasury Science Ti... Charged T... Pure Paral... Time Allo

Show: **Proposal Information**

11 errors & warnings (Click for Details)



# APT: Basics

The screenshot shows the APT software interface for a "JWST Draft Proposal (junk.aptx)" document. The window title bar reads "Astronomer's Proposal Tools Version 24.2 - JWST Draft Proposal (junk.aptx)". The menu bar includes File, Edit, Tools, Form Editor, and Help. The toolbar contains icons for Form Editor, Spreadsheet Editor, Orbit Planner, Visit Planner, View in Aladin, BOT, Target Confirmation, PDF Preview, Submission, Errors and Warnings, Run All Tools, and Stop.

The left pane displays a hierarchical tree view of the proposal structure:

- JWST Draft Proposal (junk.aptx)
  - Proposal Information
    - Proposal Description (highlighted with a blue border)
    - Unnamed PI
    - Unnamed Col
  - Targets
  - Observations
  - Observation Links

The right pane shows the "Proposal Information" section of the form editor. It includes fields for:

- Title (marked with a red X)
- Abstract (marked with a red X)
- Proposal ID (empty input field)
- Category (GO selected, Calibration and Treasury checkboxes available)
- Pure Parallel Proposal (checkbox available)
- Cycle (1 selected, dropdown menu)
- Explain unschedulable observations (checkbox available)
- Science Time (hours) (0.12)
- Charged Time (hours) (0.46)
- Request custom time allocation (checkbox available)
- Future cycles (checkbox available)
- Proprietary Period (Default selected, Default is 12 Months)
- Allow Restricted (checkbox available)
- Scientific Category (None Selected, dropdown menu)
- Science Keywords (+/- button, Choose 2 to 5 science keywords)
- Alternate Category (None Selected, dropdown menu, (Optional))
- Coordinated telescopes (checkbox available)
- PDF Attachment (empty input field, Browse... button)

At the bottom of the right pane, there are buttons for Edit Previous, New, and Edit Proposal Description. The status bar at the bottom shows "Show: Proposal Information". A message in the bottom right corner indicates "11 errors & warnings (Click for Details)".

Red "X" :

- Required Fields
- Errors in input values
- “Hover Help” shows details of the problem

Heirarchical View (Left) :

- Proposal Overview
- Basic elements
- Quick Navigation

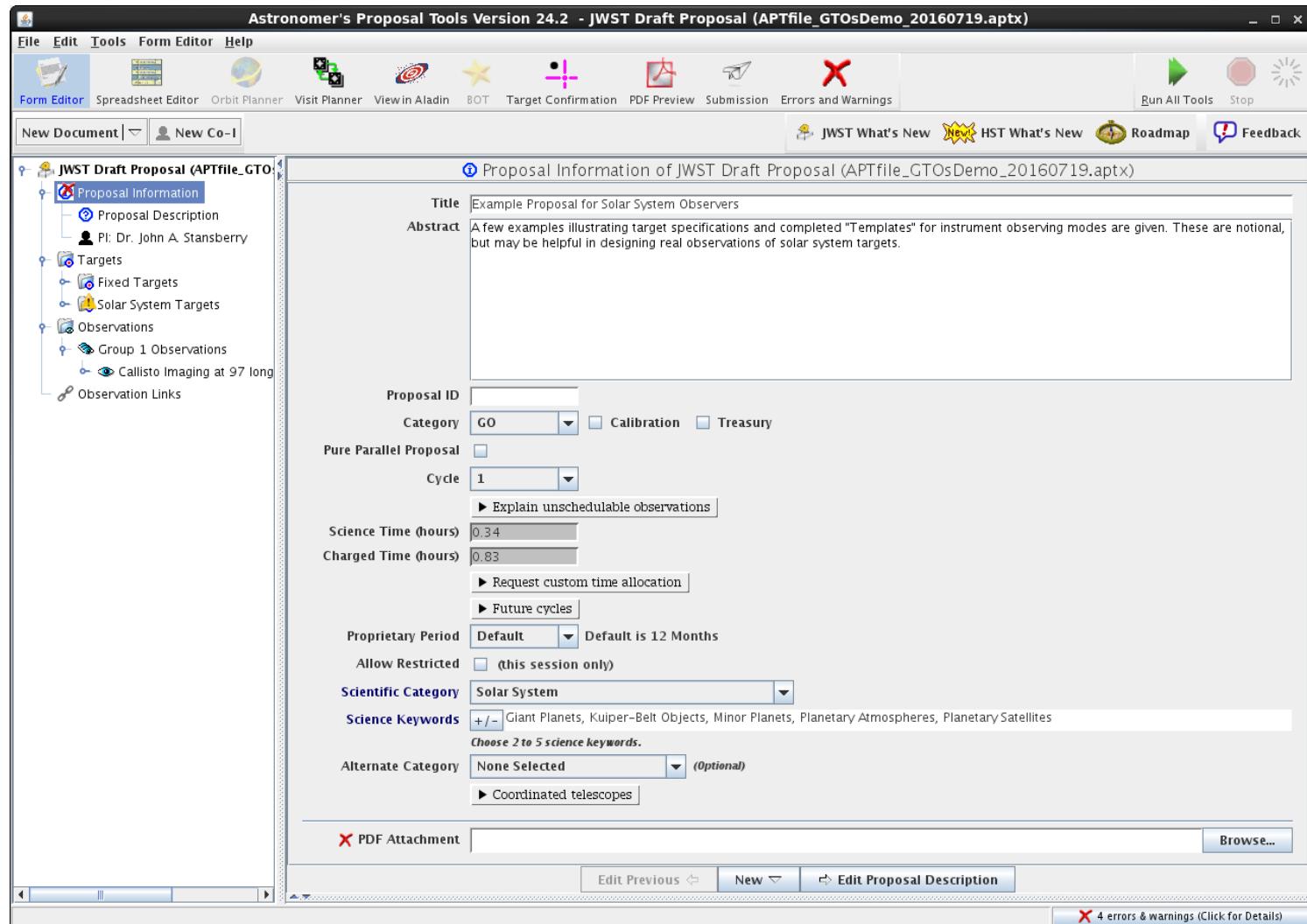
Form Editor (Right) :

- Structured workflow
- Task specific

Spreadsheet View :

- Summarizes parameters for many sub-entries
- Quick editing of related parameters

# APT: Proposal Preamble



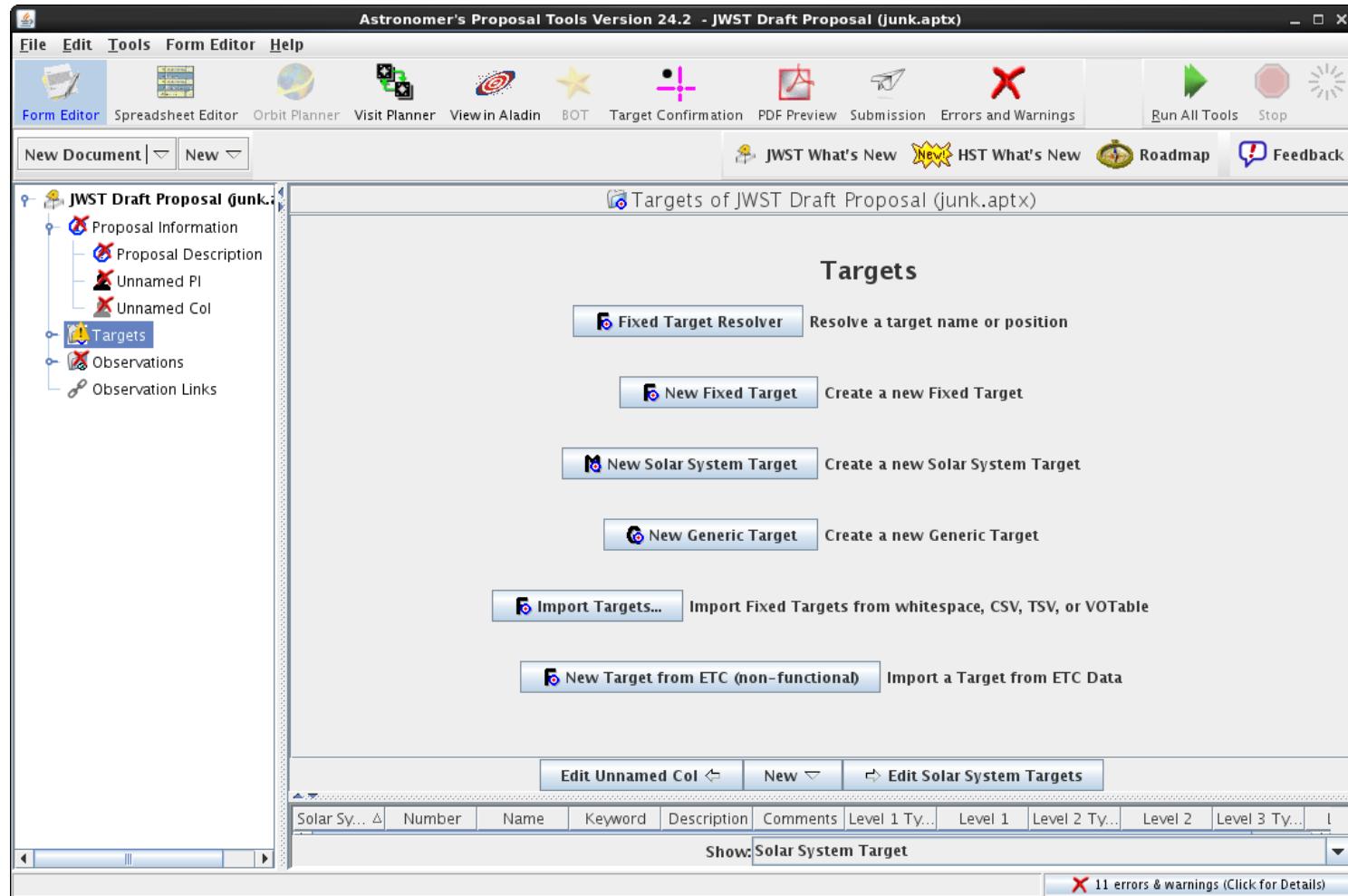
# Specifying Moving Targets

## **APT TUTORIAL**

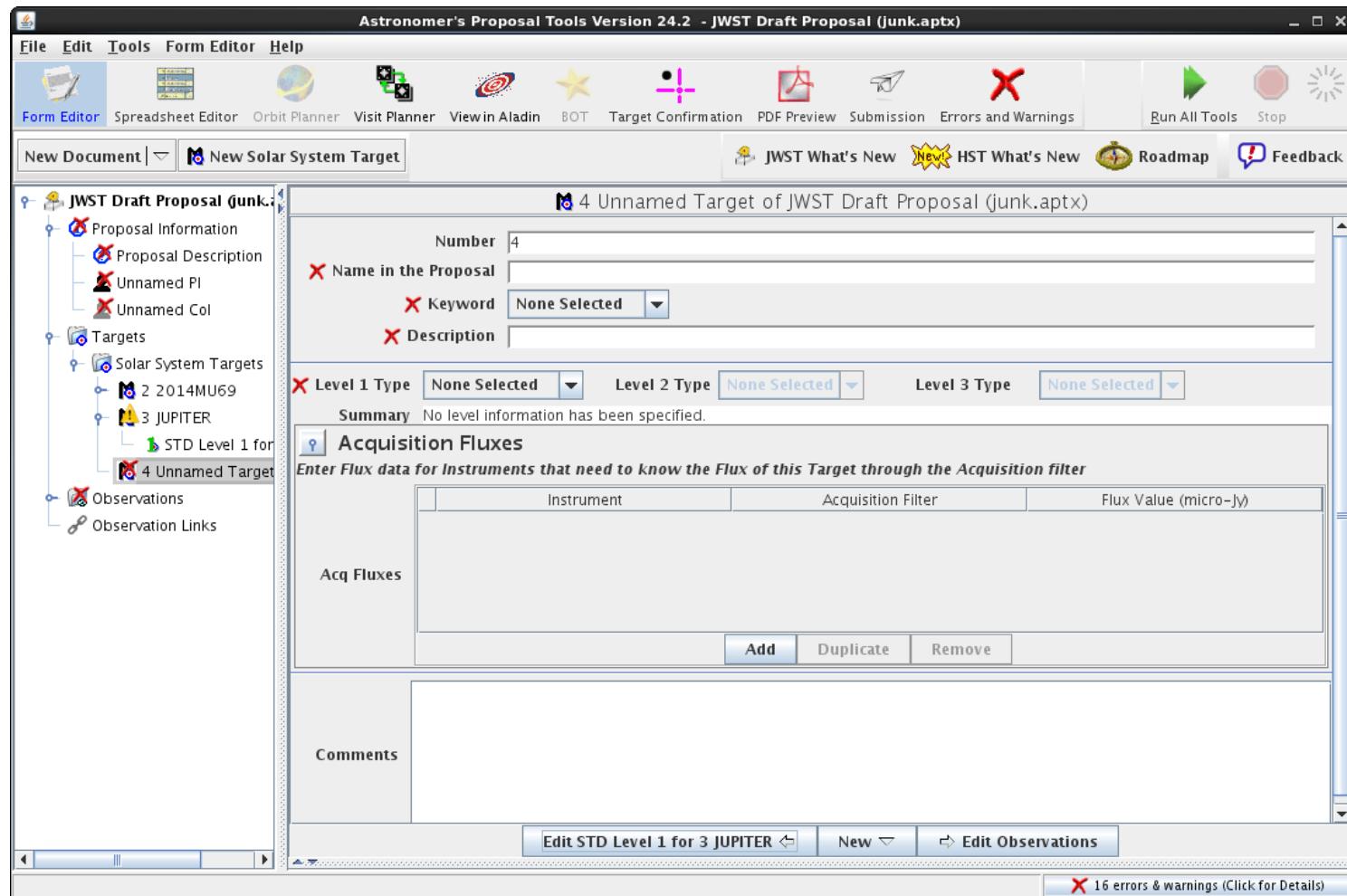
# APT Moving Target Specifications

- Inherits many capabilities from HST
  - MT Specification of Standard, Comet and Asteroid
  - Gained new interface to JPL Horizons/NAIF IDs from HST work automatically
- Reworked some HST features
  - MT Windows were part of Target definition, now specified on each observation
  - Percy script generation had to be rewritten
  - MOSS server on APT submission run by APT now moved to within PCG/JCL service
- HST updates still working toward JWST
  - MT Ephemeris visualization on sky background

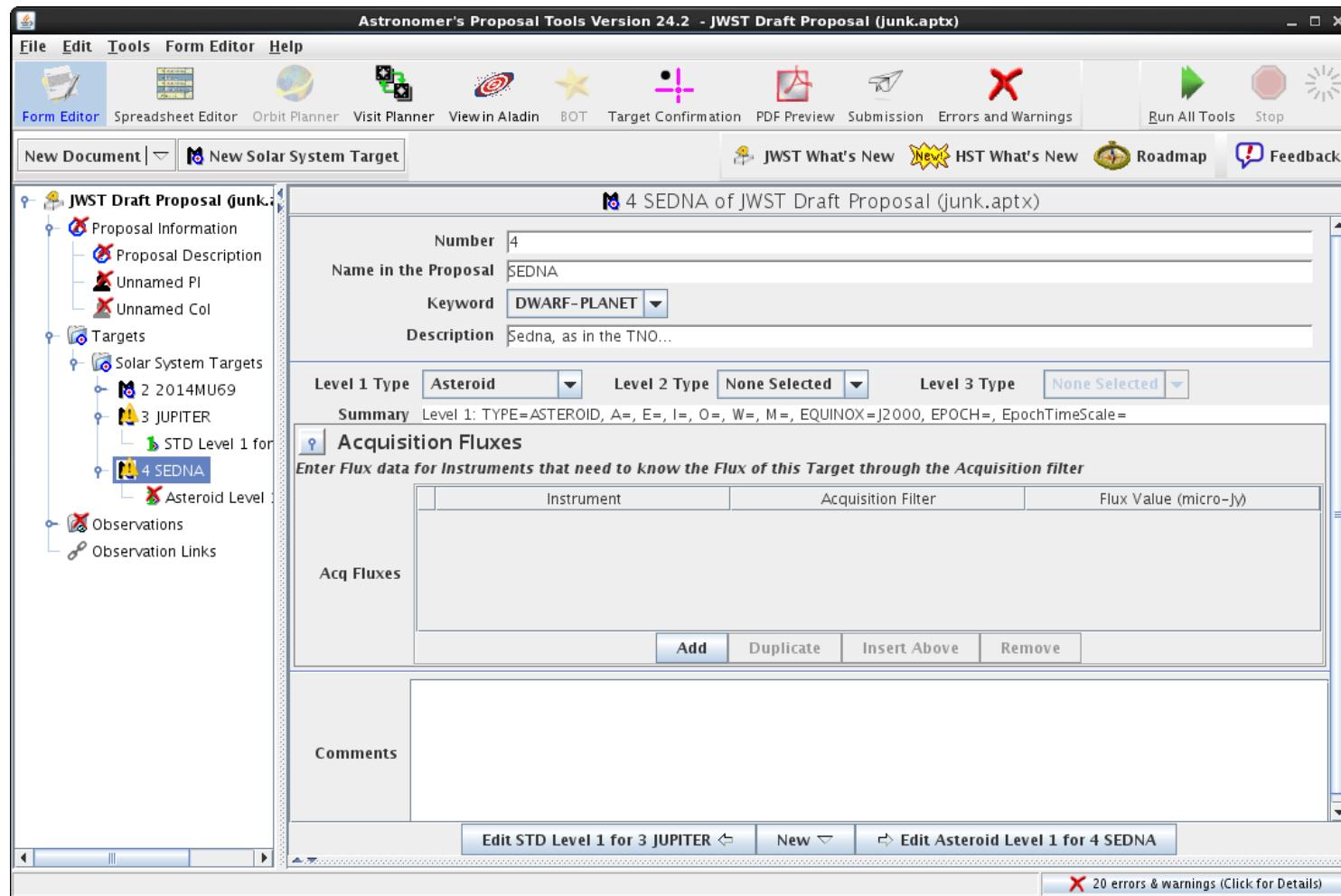
# Top Level Target Interface



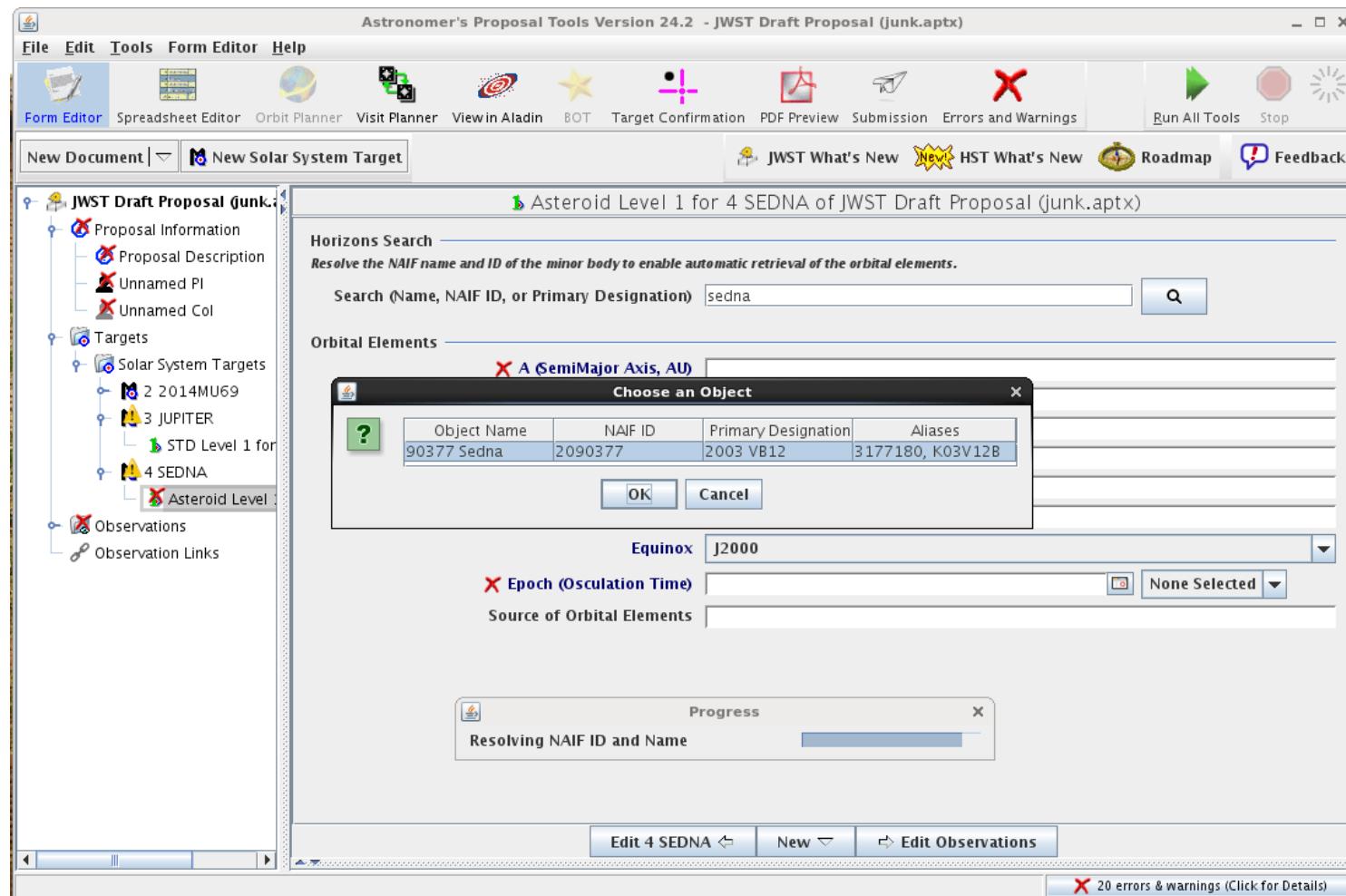
# New Moving Target



# Minor Body Interface



# Minor Body Name Resolver



# Minor Body Name Resolver

Astronomer's Proposal Tools Version 23.2 pr77524 (Mon Apr 27 2015) – Unsubmitted HST Phase II Proposal (Unsaved)

Form Editor Spreadsheet Editor Orbit Planner Visit Planner View in Aladin BOT Target Confirmation PDF Preview Submission Errors and Warnings Run All Tools Stop JWST What's New HST What's New Roadmap Feedback

New HST Proposal | Phase II->I | New Solar System Target

Unsubmitted HST Phase II Proposal  
Proposal Information  
Targets  
Solar System Targets  
1 MYCOMET  
Comet Level 1 for 1 M...

Horizons Search  
Resolve the name and ID of the comet to enable automatic retrieval of the orbital elements.

Search (Name, NAIF ID, or Primary Designation) Siding Spring

NAIF Name

Choose an Object

Object Name	NAIF ID	Primary Designat...	Aliases
2343 (Siding Spr...	2002343	1979 MD4	1977 AV, 1976 ...
Siding Spring	1000525	162P	2004 TU12, 40...
Siding Spring (C/...	1000516	C/2004 T3	K04T030
Siding Spring (P/...	1000520	P/2004 V3	K04V030
Siding Spring (P/...	1002409	P/2006 HR30	3330681, K06H...
Siding Spring (C/...	1002400	C/2006 HW51	3331062, K06H...
Siding Spring (P/...	1002413	P/2006 R1	K06R010
Siding Spring (C/...	1002459	C/2007 K3	K07K030
Siding Spring (C/...	1002472	C/2007 Q3	K07Q030
Siding Spring (C/...	1003057	C/2010 A4	K10A040
Siding Spring (C/...	1003252	C/2012 OP	3606258, K12O...
Siding Spring (P/...	1003221	P/2012 US27	3612837, K12U...
Siding Spring (C/...	1003228	C/2013 A1	K13A010

Cancel OK

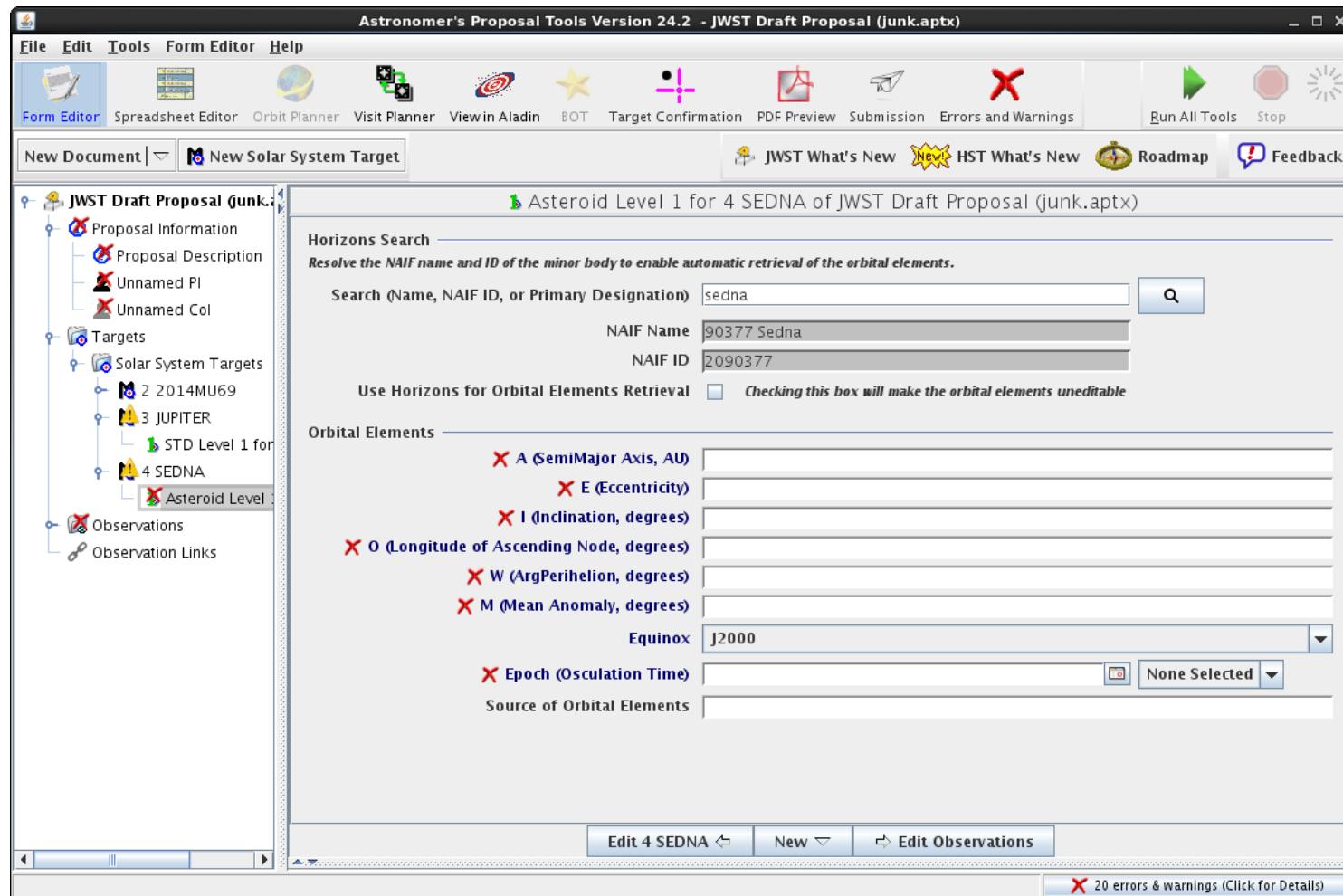
Edit 1 MYCOMET New Edit Patterns

Comet △ NAIF Name NAIF ID Enable Hor... Q (Periheli... E (Eccentri... I (Inclinati... O (Longitudi... W (ArgPerili... T (Time of ... Equinox Epoch (Os... A1 (Radial ... A2 (Velocit... A3 (Accel...

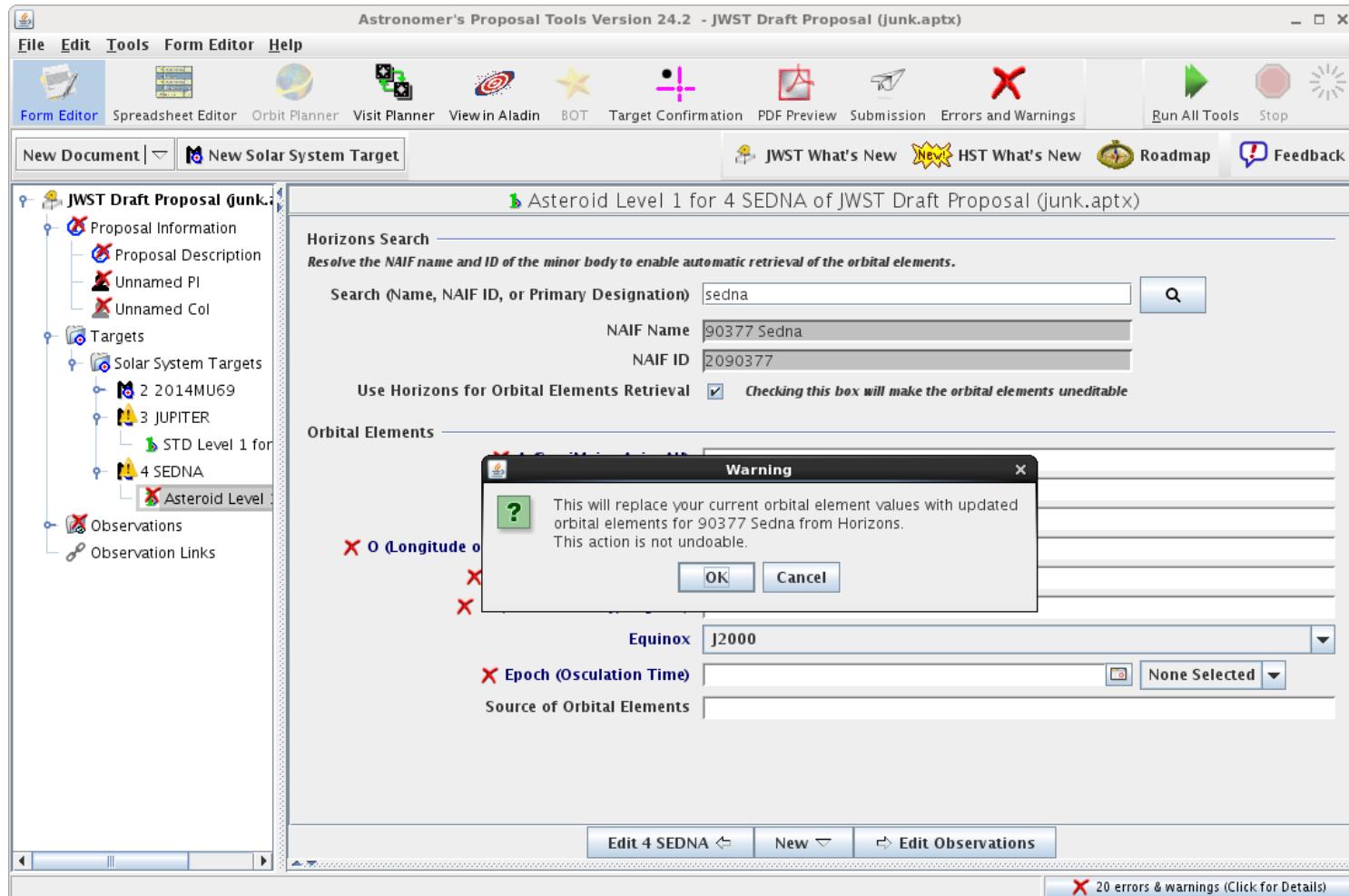
Comet Lev... J2000 Show: Comet

9/12016 APT for Solar System Observers - J. Stansberry - JWST London Workshop 18 X 16 errors & warnings (Click for Details)

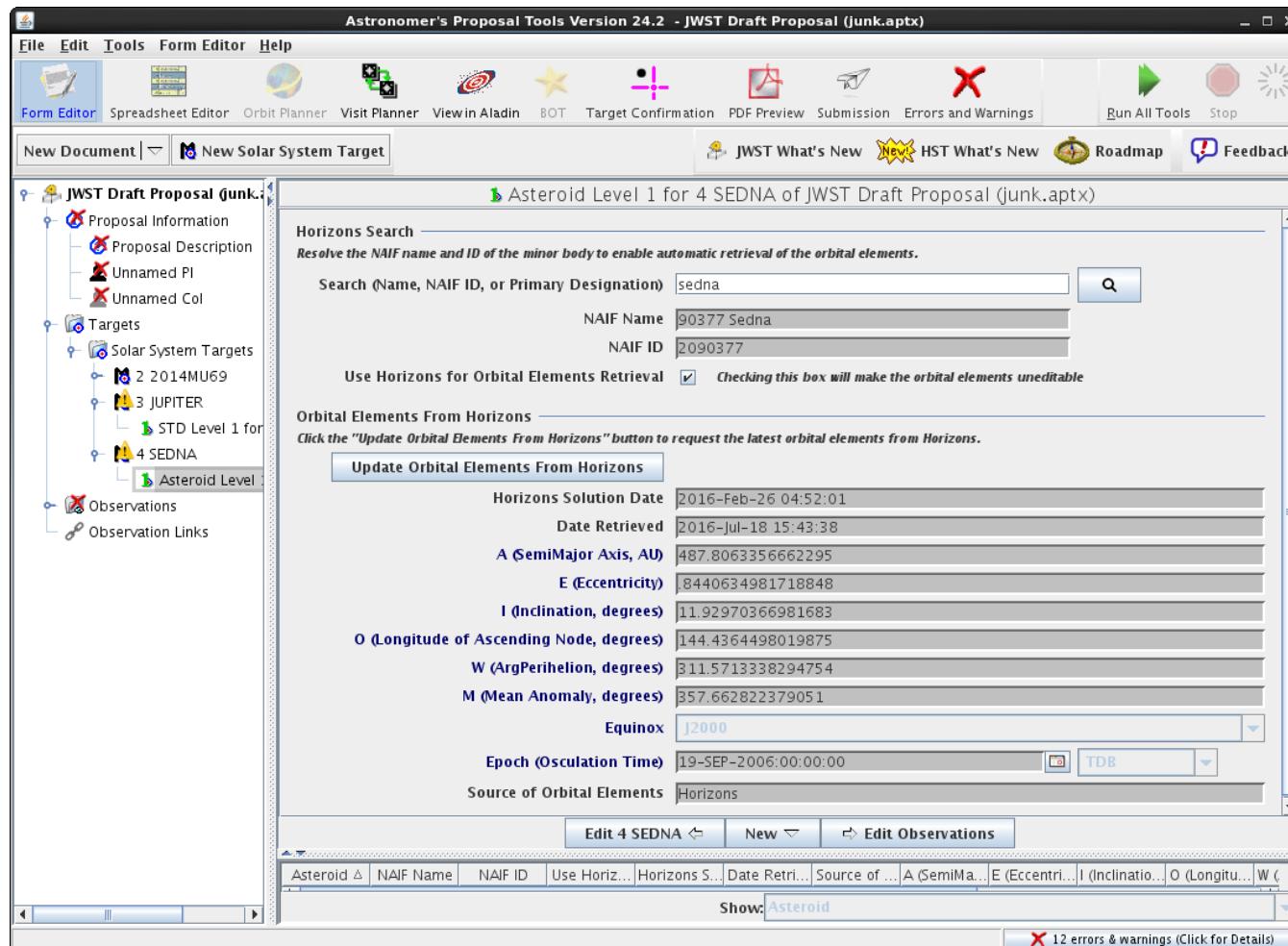
# Minor Body Name Resolver



# Minor Body Elements Retrieval



# Minor Body Elements Retrieval



*Filling this form used to be a manual process of cut/paste.*

# “Standard” Targets – Level 1

Astronomer's Proposal Tools Version 24.2 - JWST Draft Proposal (junk.aptx)

File Edit Tools Form Editor Help

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

New Document | New Solar System Target JWST What's New HST What's New Roadmap Feedback

JWST Draft Proposal (junk.aptx)

Number 3  
Name in the Proposal CALLISTO  
Keyword SATELLITE  
Description x

Level 1 Type Standard Target ▾ Level 2 Type None Selected ▾ Level 3 Type None Selected ▾

Summary Level 1: STD=JUPITER

Acquisition Fluxes  
Enter Flux data for Instruments that need to know the Flux of this Target through the Acquisition filter

Instrument	Acquisition Filter	Flux Value (micro-Jy)
Acq Fluxes		

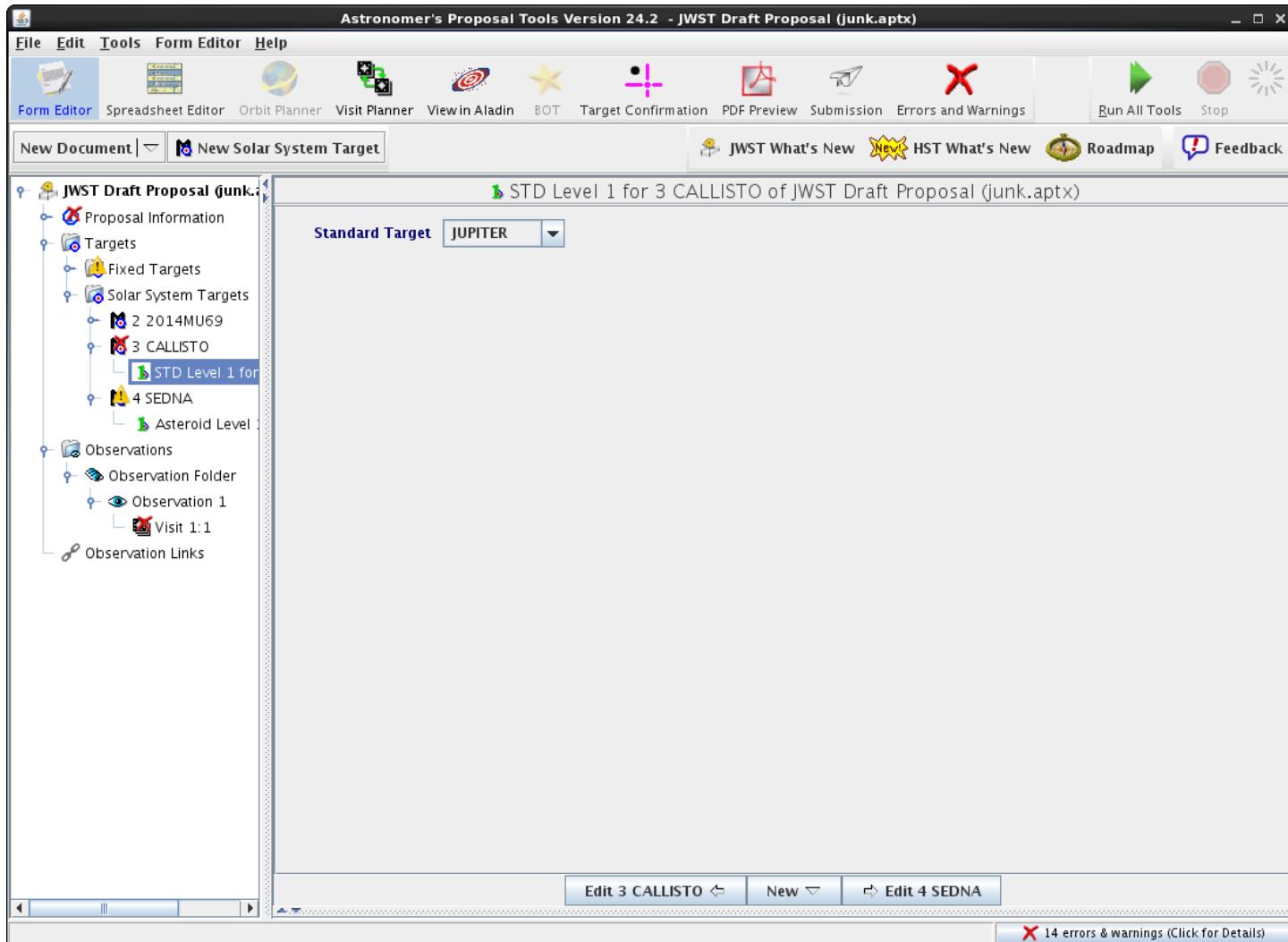
Add Duplicate Insert Above Remove

Comments

Edit Asteroid Level 1 for 2 2014MU69 ▾ New ▾ Edit STD Level 1 for 3 JUPITER

14 errors & warnings (Click for Details)

# “Standard” Targets – Level 1



# “Standard” Targets – Level 2

Astronomer's Proposal Tools Version 24.2 - JWST Draft Proposal (junk.aptx)

File Edit Tools Form Editor Help

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

New Document | New Solar System Target JWST What's New HST What's New Roadmap Feedback

JWST Draft Proposal (junk.aptx)

Number: 3  
Name in the Proposal: CALLISTO  
Keyword: SATELLITE  
Description: x

Level 1 Type: Standard Target | Level 2 Type: Standard Target | Level 3 Type: None Selected

Summary: Level 1: STD=JUPITER  
Level 2: STD=CALLISTO

Acquisition Fluxes  
Enter Flux data for Instruments that need to know the Flux of this Target through the Acquisition filter

Instrument	Acquisition Filter	Flux Value (micro-Jy)
Acq Fluxes		

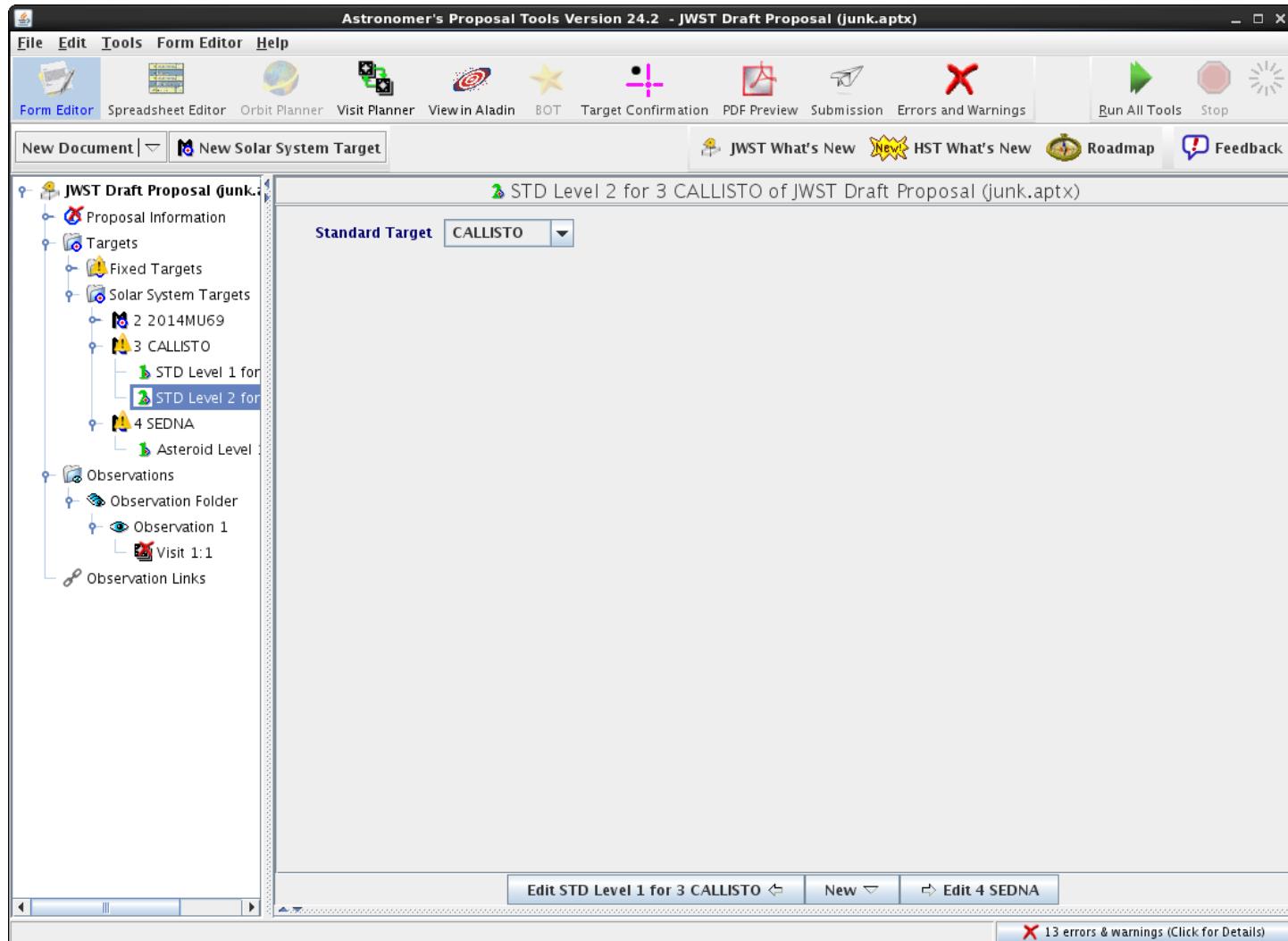
Add | Duplicate | Remove

Comments

Edit Asteroid Level 1 for 2 2014MU69 ← | New | → Edit STD Level 1 for 3 CALLISTO

13 errors & warnings (Click for Details)

# “Standard” Targets – Level 2



# “Standard” Targets – Level 3

Astronomer's Proposal Tools Version 24.2 - JWST Draft Proposal (junk.aptx)

File Edit Tools Form Editor Help

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

New Document | New Solar System Target JWST What's New HST What's New Roadmap Feedback

JWST Draft Proposal (junk.aptx)

Number: 3  
Name in the Proposal: CALLISTO-LON97  
Keyword: SATELLITE  
Description: x

Level 1 Type: Standard Target | Level 2 Type: Standard Target | Level 3 Type: Planetographic

Summary:  
Level 1: STD=JUPITER  
Level 2: STD=CALLISTO  
Level 3: TYPE=PGRAPHIC, LONG=97., LAT=0.

Acquisition Fluxes  
Enter Flux data for Instruments that need to know the Flux of this Target through the Acquisition filter

Instrument	Acquisition Filter	Flux Value (micro-Jy)
Acq Fluxes		

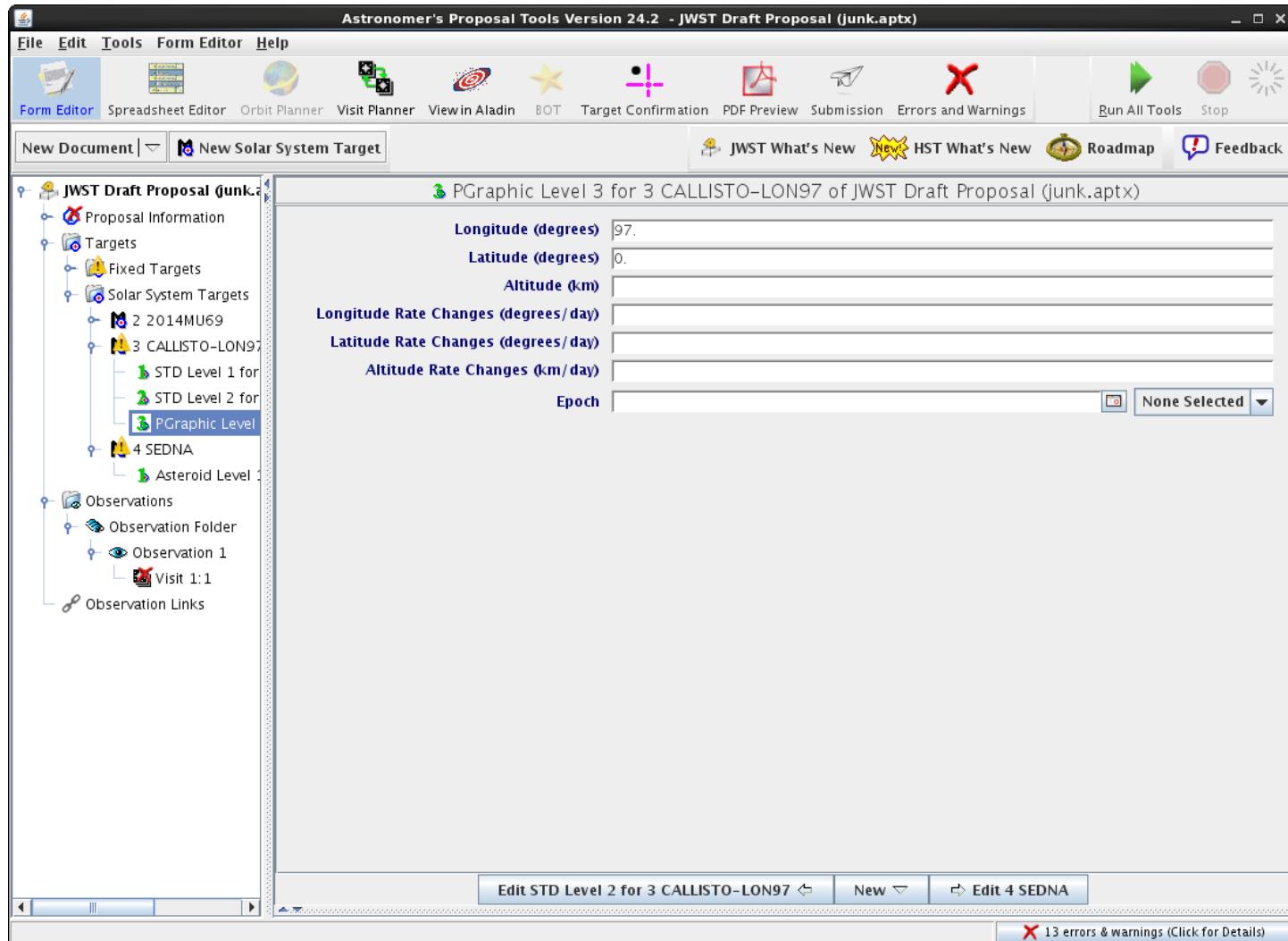
Add | Duplicate | Remove

Comments

Edit Asteroid Level 1 for 2 2014MU69 | New | Edit STD Level 1 for 3 CALLISTO-LON90

13 errors & warnings (Click for Details)

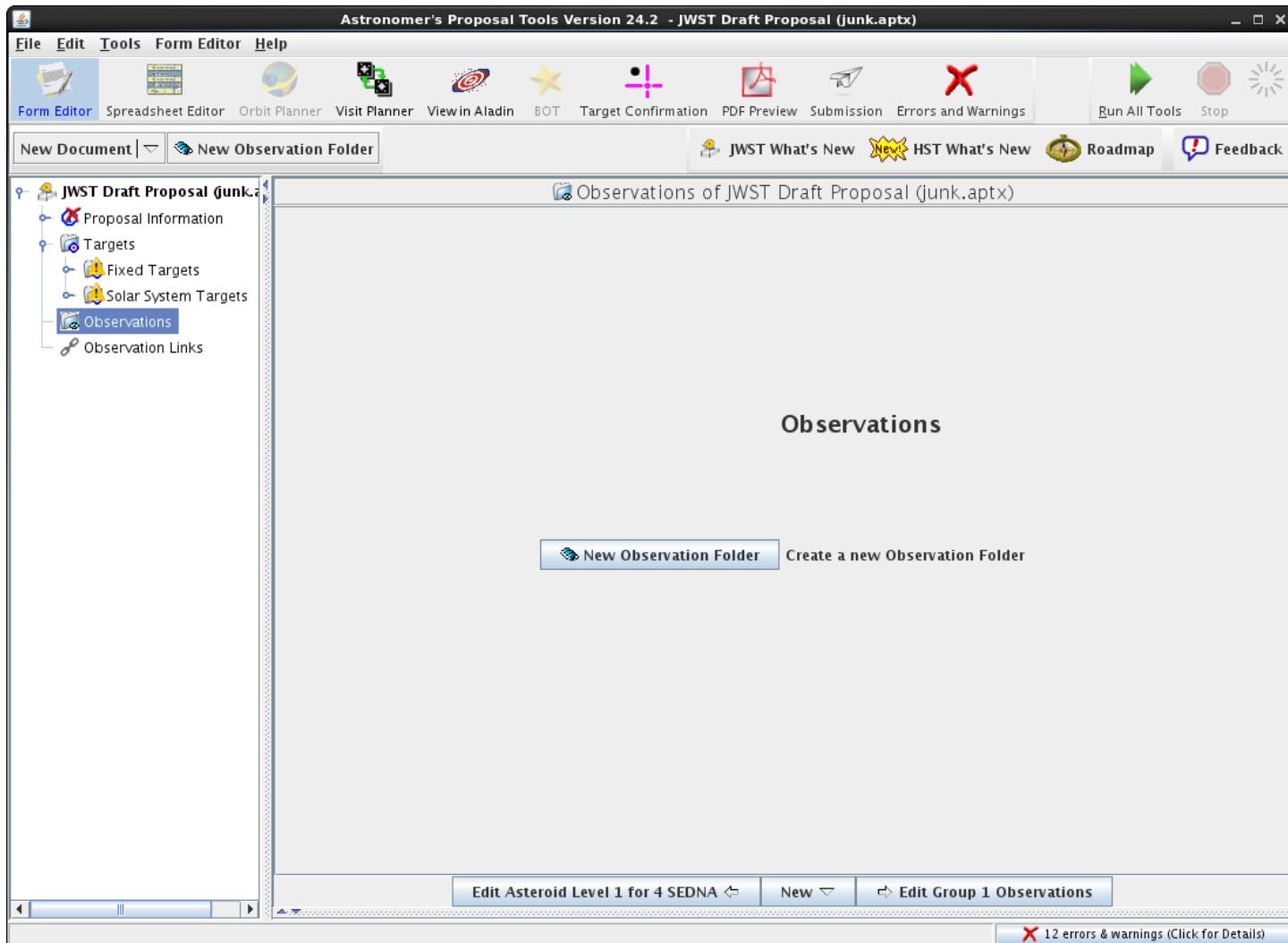
# “Standard” Targets – Level 3



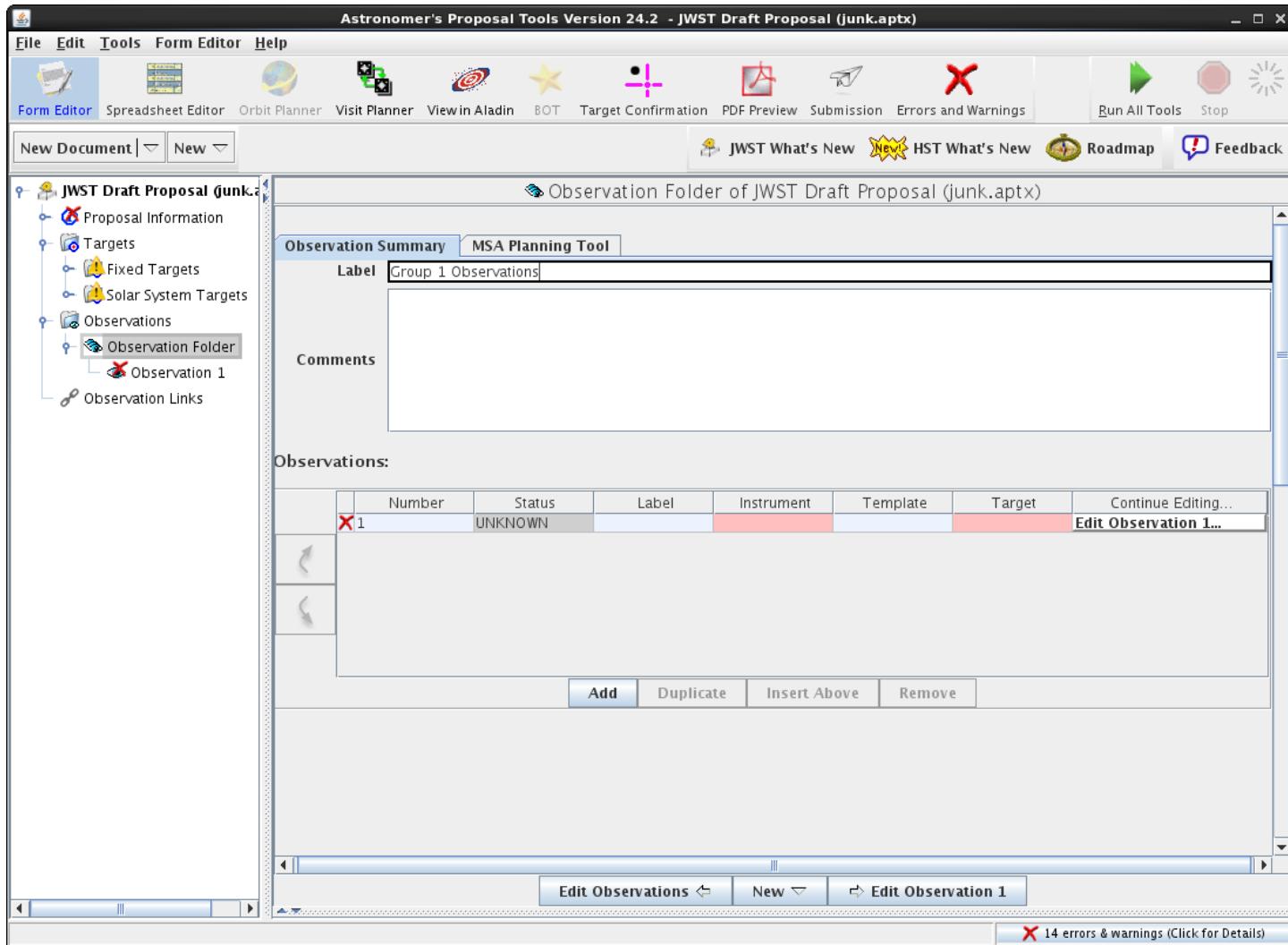
Program Organization,  
Execution Control (Constraints)

## **APT TUTORIAL**

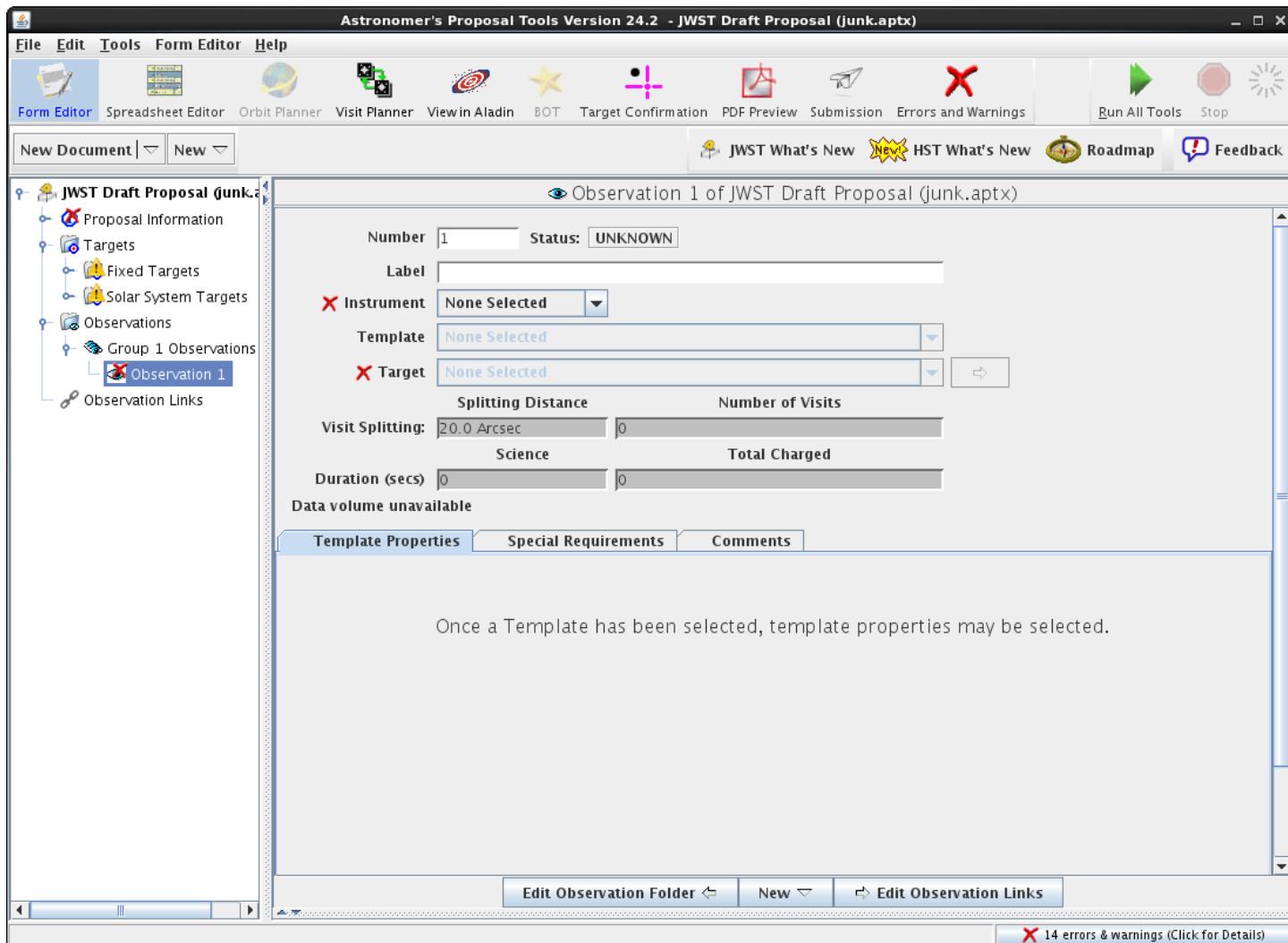
# Observation Folders



# Observation Folders



# Observation Folders



***Observation Folders are simply organizational tools. Use 1 or many.***

# Moving Targets Constraints

The screenshot shows the Astronomer's Proposal Tools Version 23.2 (pr77524) interface for an "Unsubmitted JWST Phase II Proposal (JWST\_MT\_TEM.aptx)".

**Left Panel (Tree View):**

- Unsubmitted JWST Phase II Proposals
  - Proposal Information
  - Targets
    - Solar System Targets
      - 1 SINOPE-45
      - 2 COMET-SIDING-SPRING
      - Comet Level 1 for 2 CC
  - Data Requests
  - Observation Folder
    - Observation 1
  - Observation Links

**Right Panel (Observation Configuration):**

**Observation 1 of Unsubmitted JWST Phase II Proposal (JWST\_MT\_TEM.aptx)**

Number: 1  
Label:   
Instrument: MIRI  
Template: MIRI Imaging  
Target: 1 SINOPE-45  
Splitting Distance: 20.0 Arcsec  
Number of Visits: 1  
Visit Splitting: Science Total Charged  
Duration (secs): 4884 8525  
Data volume: 476 MB

**MIRI Imaging Tab:**

Observing Windows

MOSS Planning Start:   
MOSS Planning End:   
MOSS Show Windows:

**Special Requirements Tab:**

New Transit Observing Window  
New Solar Phase Observing Window  
New Distance Observing Window  
New Radial Velocity Observing Window  
New Orbital Longitude Observing Window  
New Occultation Window  
New Eclipse Observing Window  
New Central Meridian Longitude Observing Window  
New Angular Rate Observing Window  
New Separation Observing Window  
New Apparent Diameter Observing Window

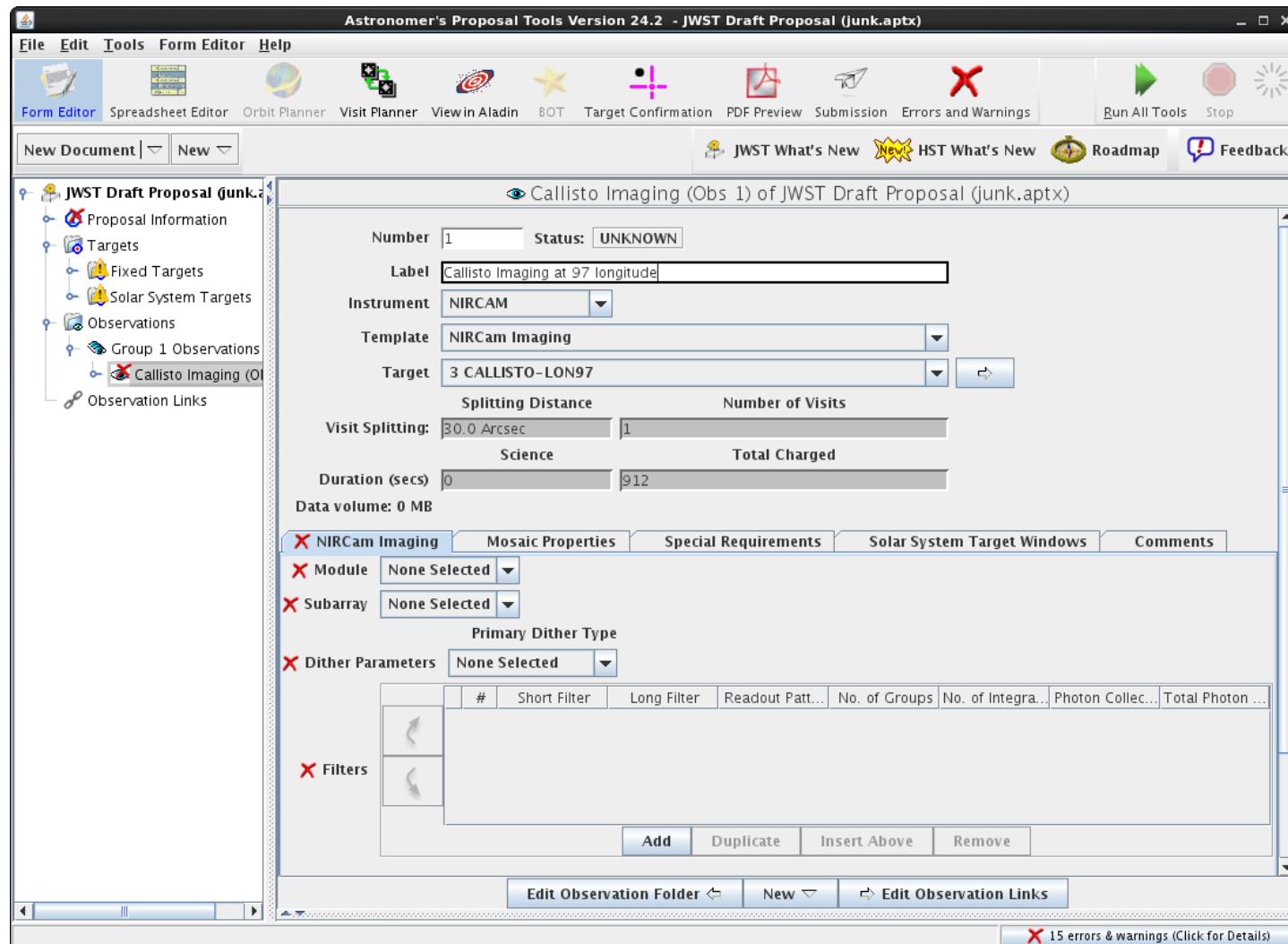
**Comments Tab:**

warnings (Click for Details)

# Template Example: NIRCam Imaging

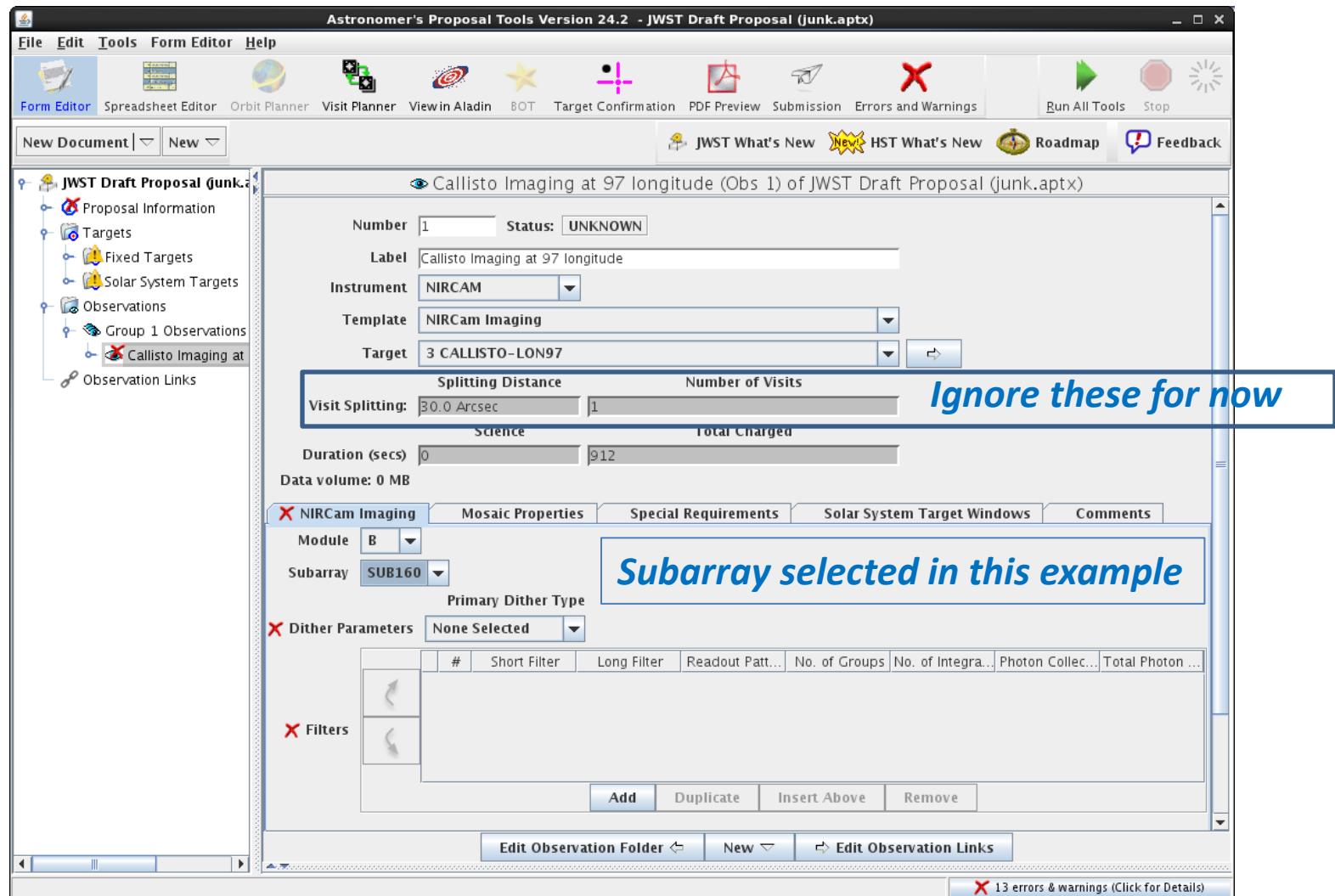
## **APT TUTORIAL**

# APT: NIRCam Imaging Template



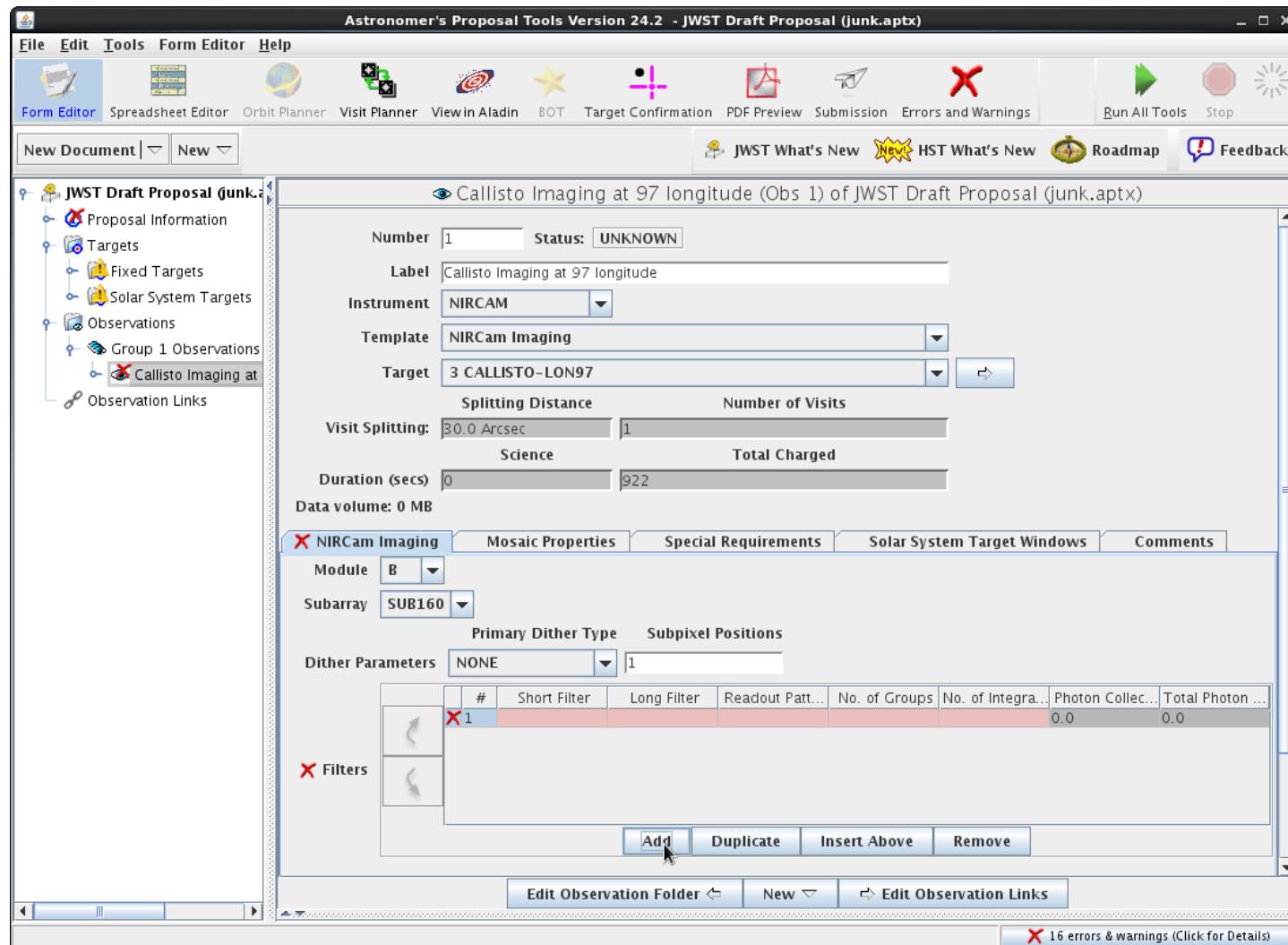
*Select: Instrument; Template; Target*

# APT: NIRCam Imaging Template



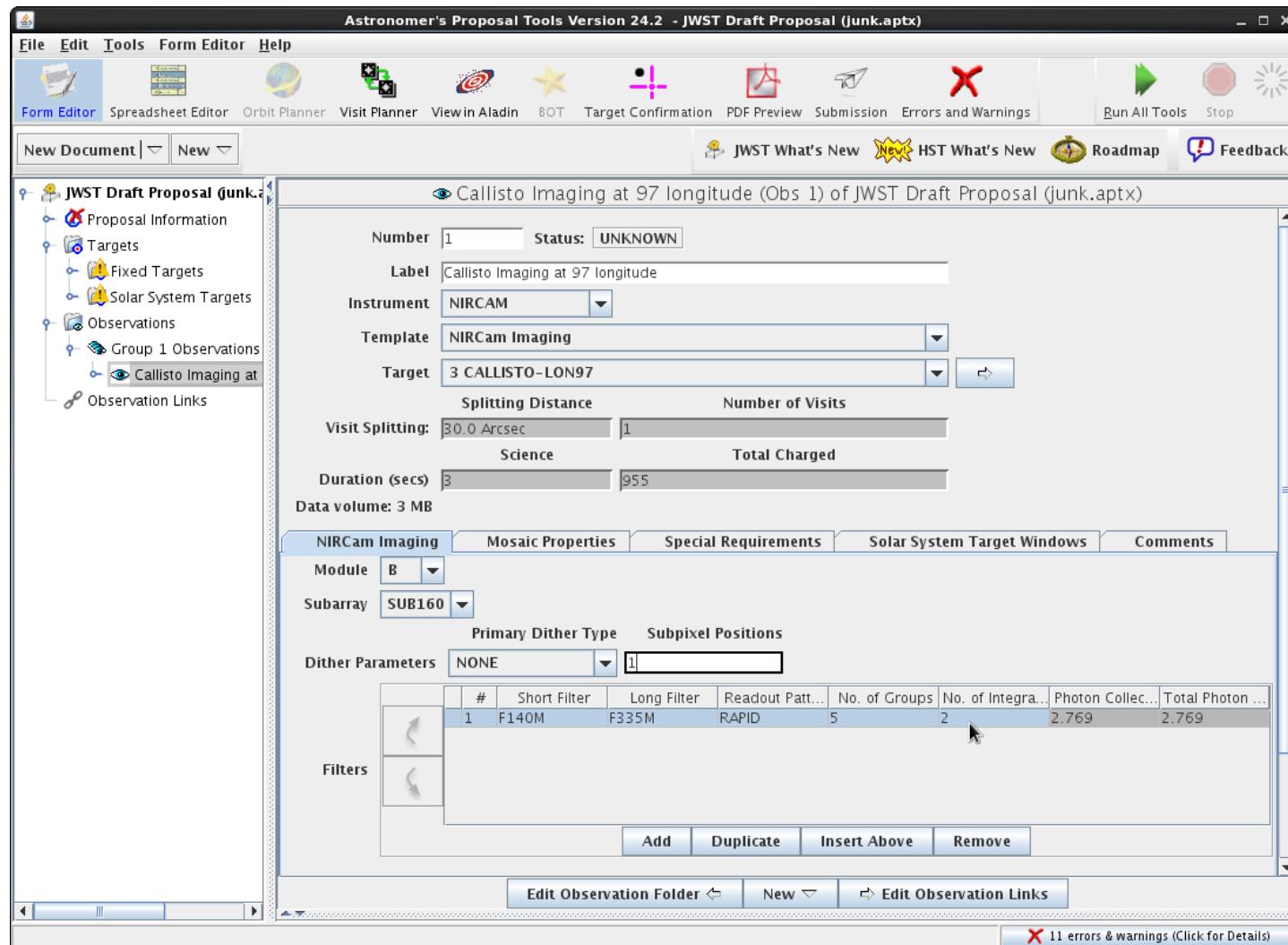
**Select: Module (which ½ of NIRCam); Subarray (FOV, Bright Limit)**

# APT: NIRCam Imaging Template



Select: Primary (Large); Subpixel (Small) Dithers  
PSF Sampling, Photometric accuracy, Depth & Evenness of Coverage

# APT: NIRCam Imaging Template



**Add: Filters, Exposure Parameters ("Exposure Specification")**

# APT: NIRCam Imaging Template

The screenshot shows the APT software interface for creating a JWST Draft Proposal. The main window displays the 'NIRCam Imaging' template for 'Callisto Imaging at 97 longitude (Obs 1)'. The left sidebar shows the project structure under 'JWST Draft Proposal (junk.aptx)'.

**Template Parameters:**

- Number: 1, Status: UNKNOWN
- Label: Callisto Imaging at 97 longitude
- Instrument: NIRCAM
- Template: NIRCam Imaging
- Target: 3 CALLISTO-LON97
- Visit Splitting: 30.0 Arcsec, Number of Visits: 1
- Duration (secs): 3, Total Charged: 955

**Observation Details:**

- Module: B
- Subarray: SUB160
- Dither Parameters: Primary Dither Type: NONE, Subpixel Positions: 1

**Filters:**

#	Short Filter	Long Filter	Readout Patt...	No. of Groups	No. of Integrat...	Photon Collect...	Total Photon ...
1	F140M	F335M	RAPID	5	2	2.769	2.769

**Buttons and Links:**

- Edit Observation Folder, New, Edit Observation Links
- Run All Tools, Stop
- JWST What's New, HST What's New, Roadmap, Feedback

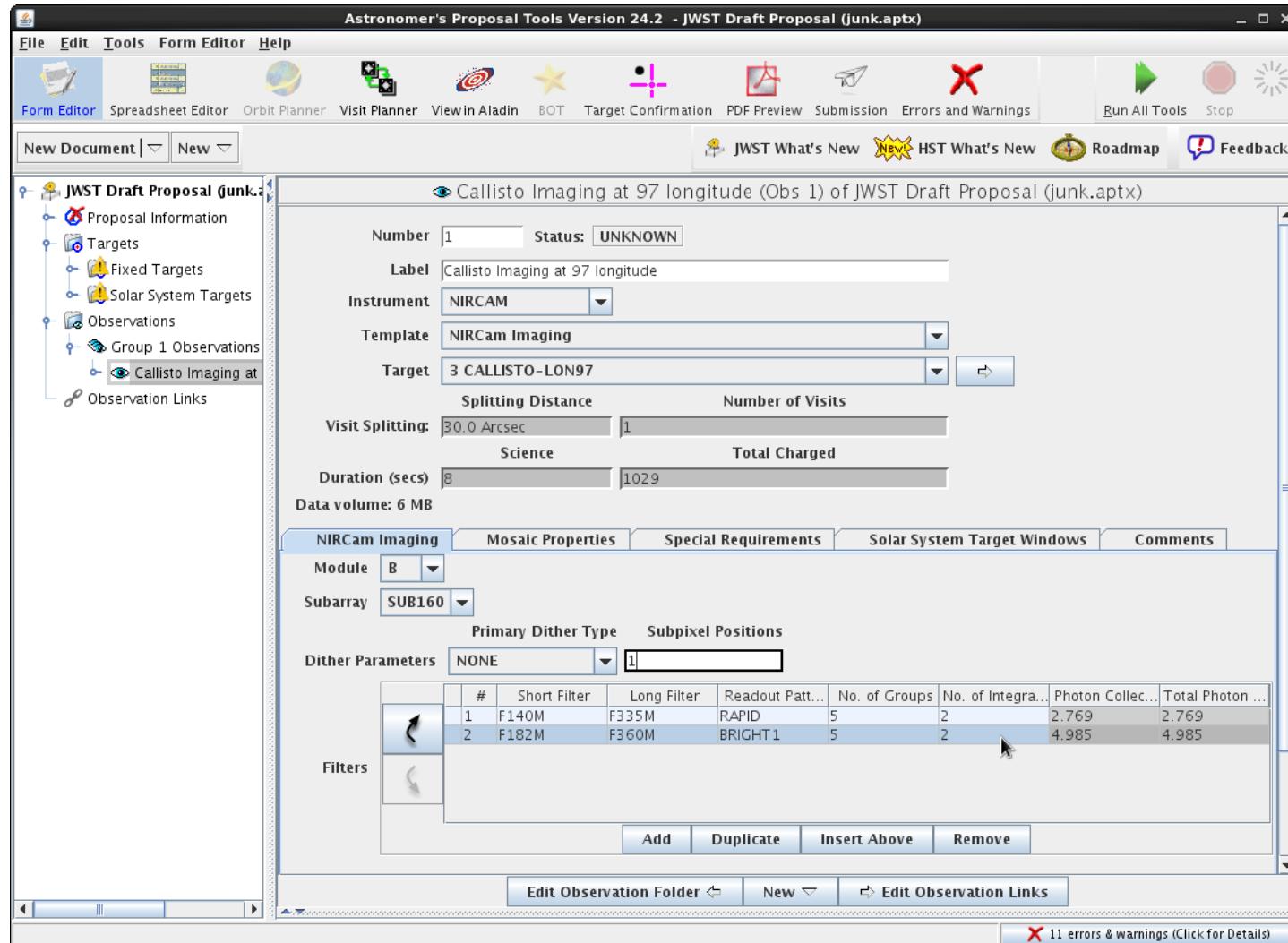
**Errors & Warnings:** 11 errors & warnings (Click for Details)

*Exposure time per dither position*

*Total Exposure time*

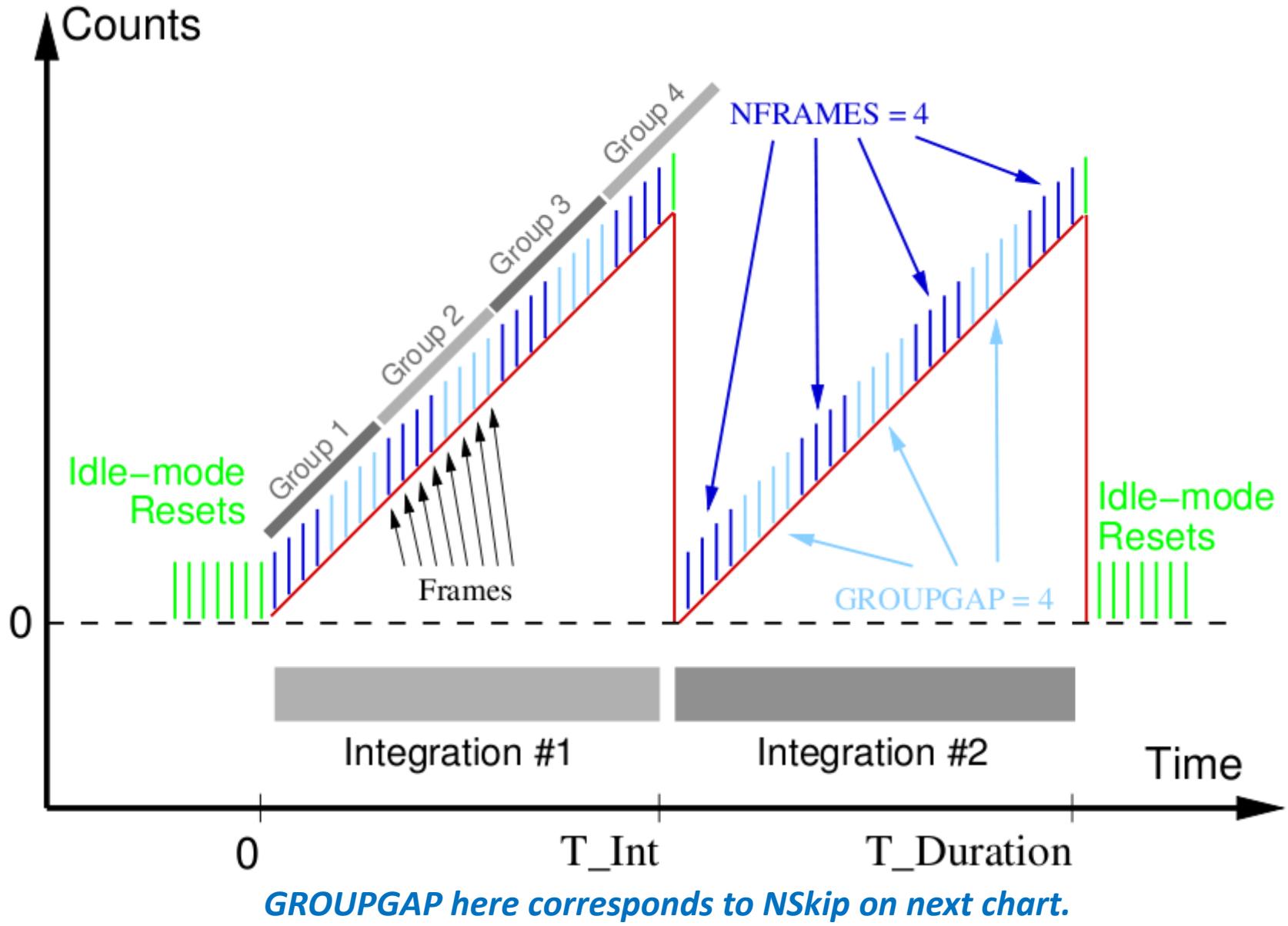
*Add: Filters, Exposure Parameters ("Exposure Specification")*

# APT: NIRCam Imaging Template



*Add: Additional Exposure Specifications*

# JWST Exposures: Frames, Groups, Integrations



# APT Exposure Parameters for JWST: Demystified?

JWST Exposures: 'MULTIACCUM' Patterns, NGroups, and Integration Times								
Instrument	APT User Inputs for Exposures			"Under the Hood "				T_Int*** (sec)
	Pattern	Ngroups*	Subarray**	NFrames	GroupGap	TFrame	TGroup	
NIRCam		5	Full	1	0	10.74	10.74	53.70
	RAPID	5	320	1	0	1.07	1.07	5.35
		5	64	1	0	0.05	0.05	0.25
	BRIGHT1	5	Full	1	1	10.74	21.48	96.66
	BRIGHT2	5	Full	2	0	10.74	21.48	107.40
	SHALLOW2	5	Full	2	3	10.74	53.70	236.28
	SHALLOW4	5	Full	4	1	10.74	53.70	257.76
	MEDIUM2	5	Full	2	8	10.74	107.40	451.08
	MEDIUM8	5	Full	8	2	10.74	107.40	515.52
	DEEP2	5	Full	2	18	10.74	214.80	880.68
	DEEP8	5	Full	8	12	10.74	214.80	945.12
NIRISS	NISRAPID	5	Full	1	0	10.74	10.74	53.70
	NIS	5	Full	4	0	10.74	42.96	214.80
NIRSpec	NRSRAPID	5	Full	1	0	10.74	10.74	53.70
	NRS	5	Full	4	0	10.74	42.96	214.80
	NRSIRS2RAPID	5	Full	1	0	14.59	14.59	72.95
	NRSIRS2 †	5	Full	5	0	14.59	72.95	364.75
MIRI	FASTMODE	5	Full	1	0	2.79	2.79	13.95
		5	128	1	0	0.11	0.11	0.56
	SLOWMODE	5	Full	1	0	27.12	27.12	135.60
		5	128	1	0	0.54	0.54	2.69
	FASTGRPAVG	8	FULL	4	0	1.33	5.304	42.432

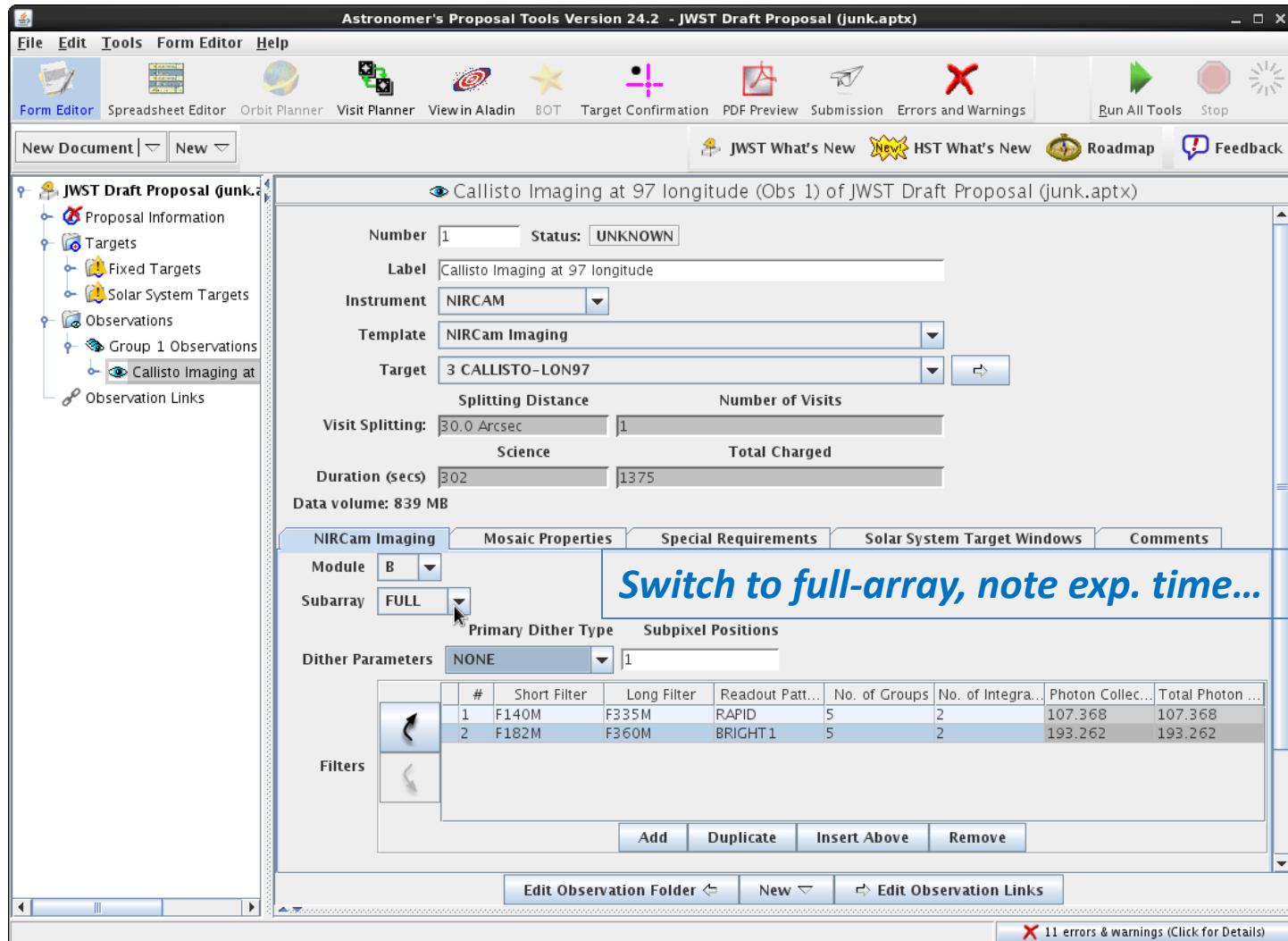
\* Ngroups values are examples. Allowed values range from 1 to thousands, depending on instrument.

\*\* Only a small subset of subarray options are shown, and only for NIRCam and MIRI, as examples.

\*\*\* Integration time per data ramp. Total exposure time can be increased using NIints > 1, and/or by dithering.

† Sum of 5 frames is bit-shifted by 3 on-board, DN corrected in the pipeline by 8/5.

# NIRCam Imaging Full- vs. Subarray



**Integration time depends on Pattern, Groups, Integrations –and– Subarray**

# NIRCam Imaging – Subpixel Dithers

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File Edit Tools Form Editor Help

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

New Document | New | JWST What's New HST What's New Roadmap Feedback

JWST Draft Proposal

Proposal Information Targets Observations Group 1 Observations Callisto Imaging Observation Links

Callisto Imaging at 97 longitude (Obs 1) of JWST Draft Proposal (junk.aptx)

Number: 1 Status: UNKNOWN

Label: Callisto Imaging at 97 longitude

Instrument: NIRCAM

Template: NIRCam Imaging

Target: 5 M-35

Splitting Distance Number of Visits

Visit Splitting: 80.0 Arcsec 1

Science Total Charged

Duration (secs) 1208 2857

Data volume: 3,356 MB

NIRCam Imaging Mosaic Properties Special Requirements Comments

Module: B

Subarray: FULL

Primary Dither Type Subpixel Positions

Dither Parameters: NONE 4

#	Short ...	Long...	Readout P...	No. of Groups	No. of Integr...	Photon Collect Duration	Total Photon Collect Duration
1	F140M	F335M	RAPID	5	2	107.368	429.472
2	F182M	F360M	BRIGHT1	5	2	193.262	773.048

Add Duplicate Insert Above Remove

Edit Group 1 Observations | New | Edit Visit 1:1

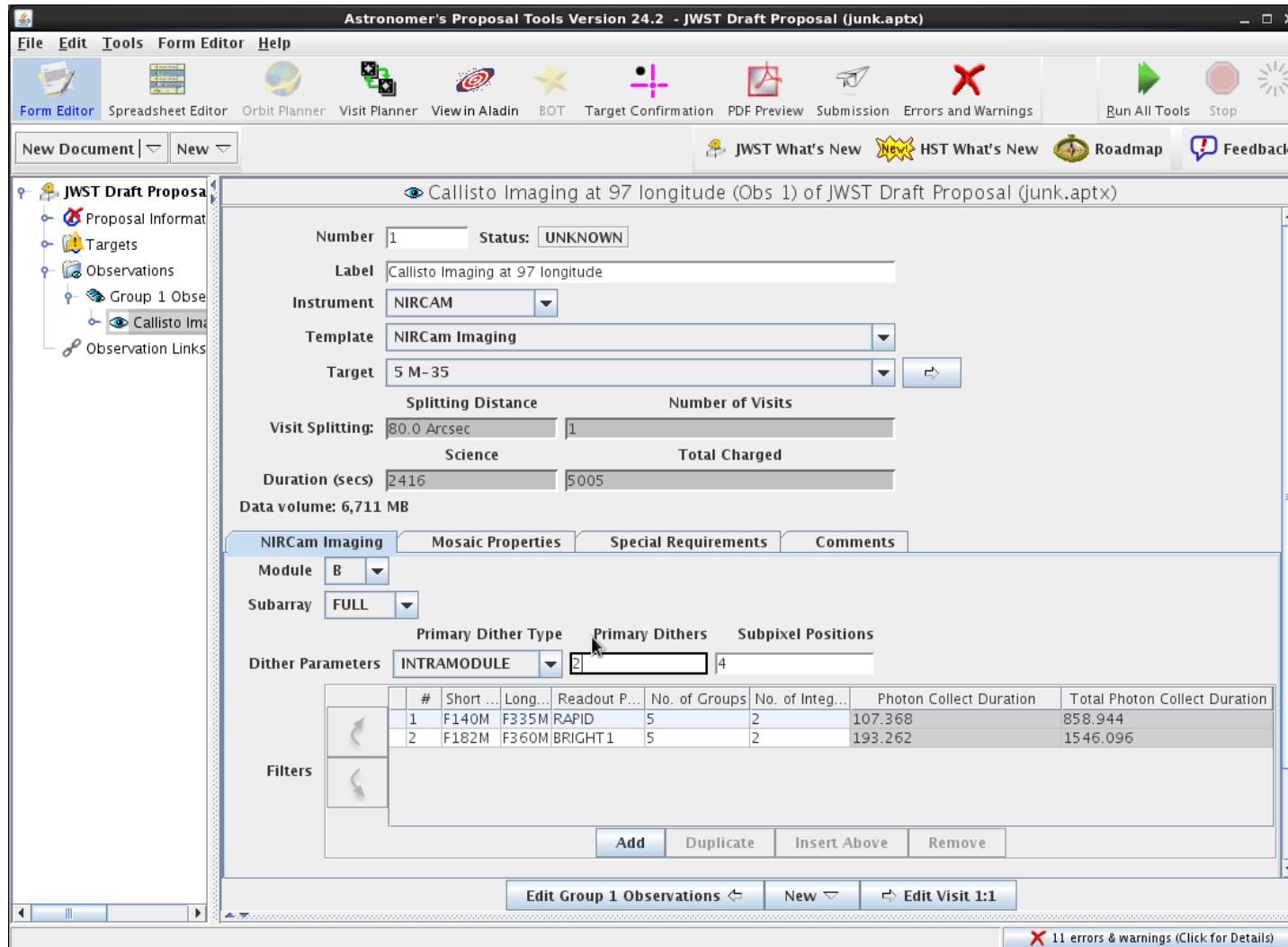
11 errors & warnings (Click for Details)

Exposure time per dither position

Total Exposure time

Exposure time depends on Integration Time –and– Dithers

# NIRCam Primary and Subpixel Dithers



**NIRCam executes Subpixel dithers at each Primary dither position**

Visualization of Dithers (using  
a fixed-target proxy)

## **APT TUTORIAL**

# Use a Fixed-Target Proxy for Moving Targ. Visualization

2nd: Click “View in Aladin” button

JWST Draft Proposal (junk.aptx)

New Document | New | JWST What's New | HST What's New | Roadmap | Feedback

File Edit Tools Form Editor Help

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

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Science Duration (secs): 1208 | Total Charged: 2857

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NIRCam Imaging Mosaic Properties Special Requirements Comments

Module: B Subarray: FULL

Dither Parameters: Primary Dither Type: Subpixel Positions: NONE | 4

#	Short ...	Long...	Readout P...	No. of Groups	No. of Integr...	Photon Collect Duration	Total Photon Collect Duration
1	F140M	F335M	RAPID	5	2	107.368	429.472
2	F182M	F360M	BRIGHT1	5	2	193.262	773.048

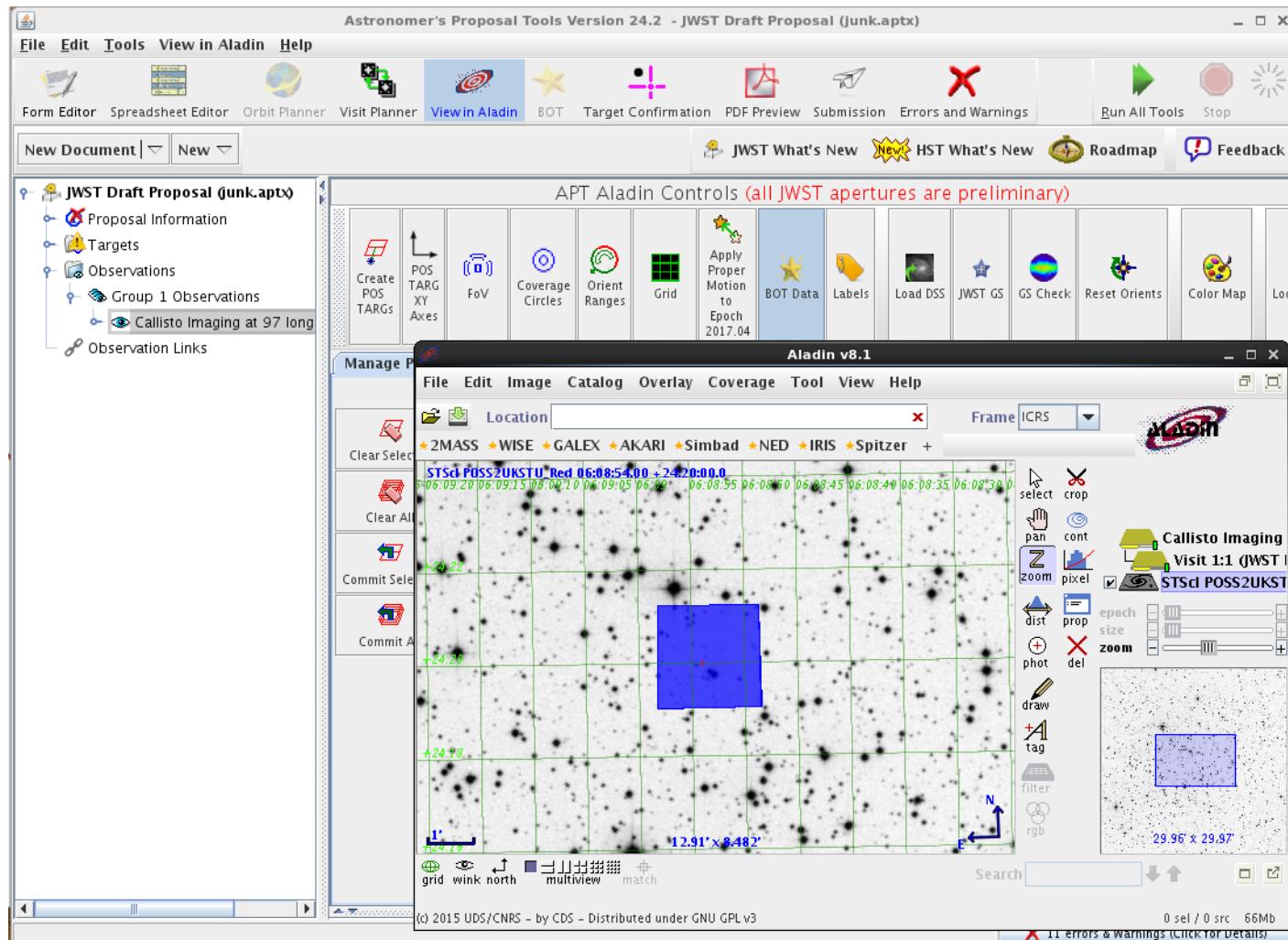
Filters: Add Duplicate Insert Above Remove

Edit Group 1 Observations | New | Edit Visit 1:1

11 errors & warnings (Click for Details)

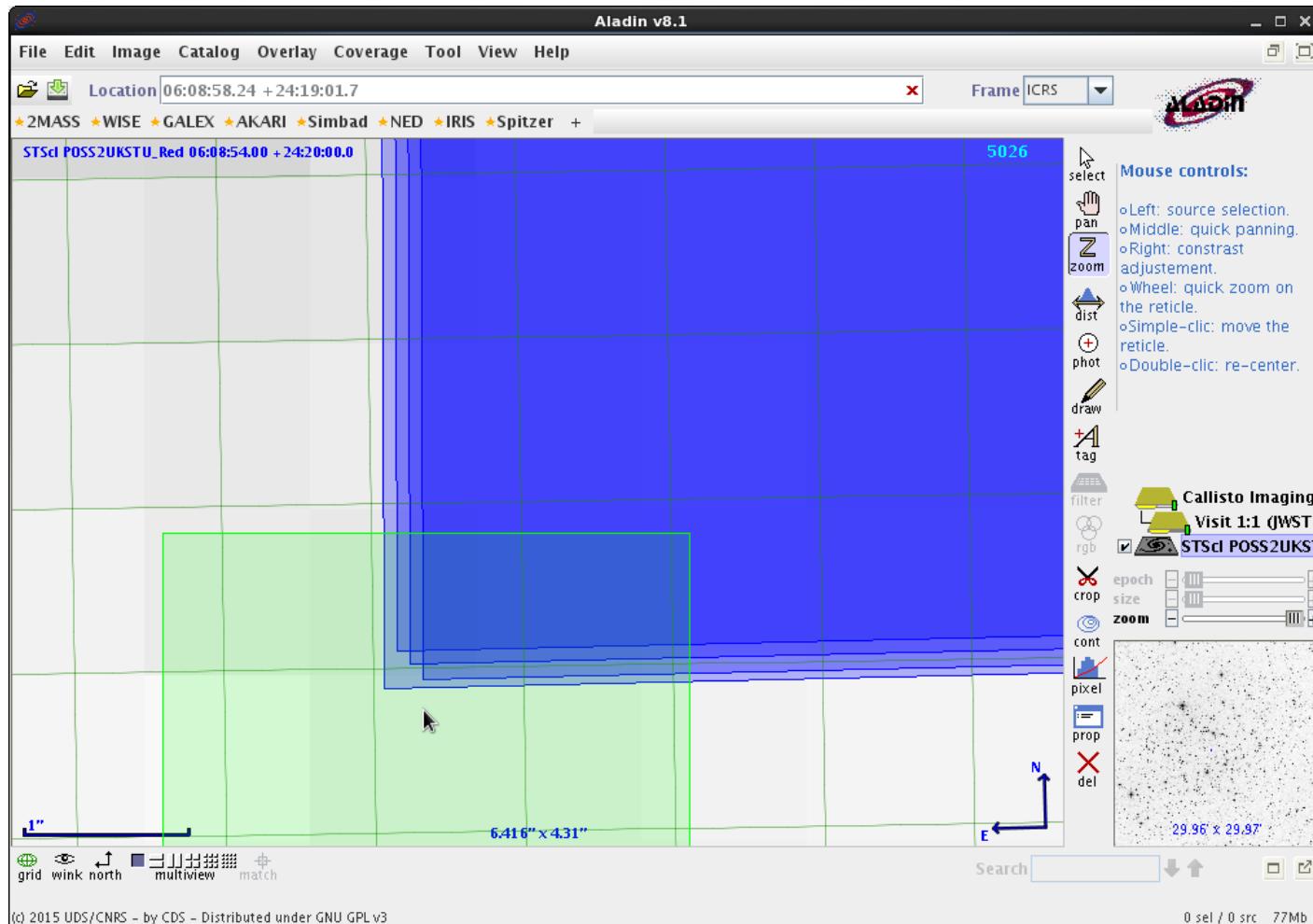
1st: M35 is a nice moving-target proxy: open cluster on the ecliptic

# NIRCam Module-B FOV on DSS



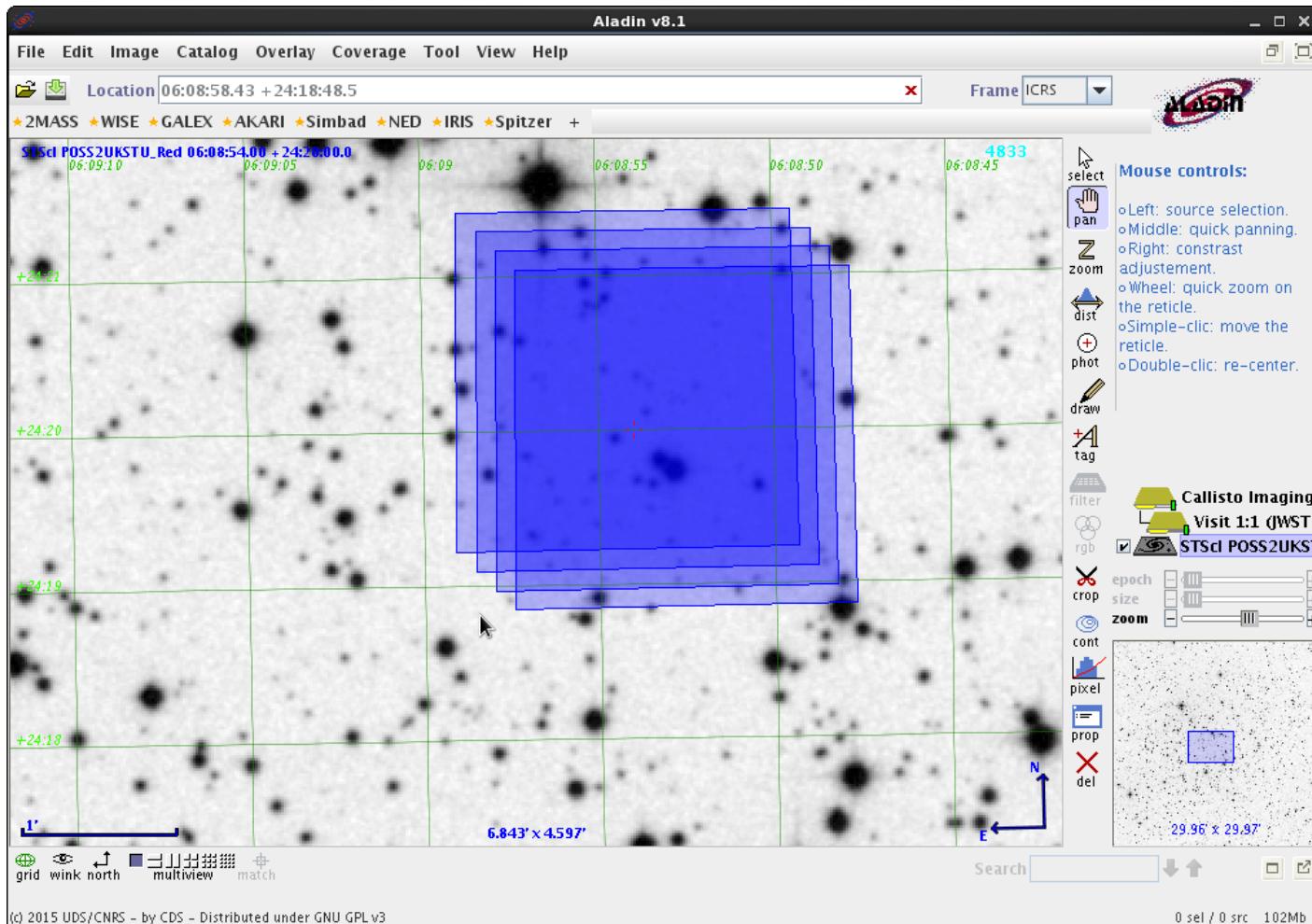
**The highlighted observation will be displayed. Various sky catalogs can also be shown.**

# NIRCam Subpixel Dithers at Large Zoom



***Click Zoom, then click (repeatedly) in the Aladin display at the zoom point you desire.***

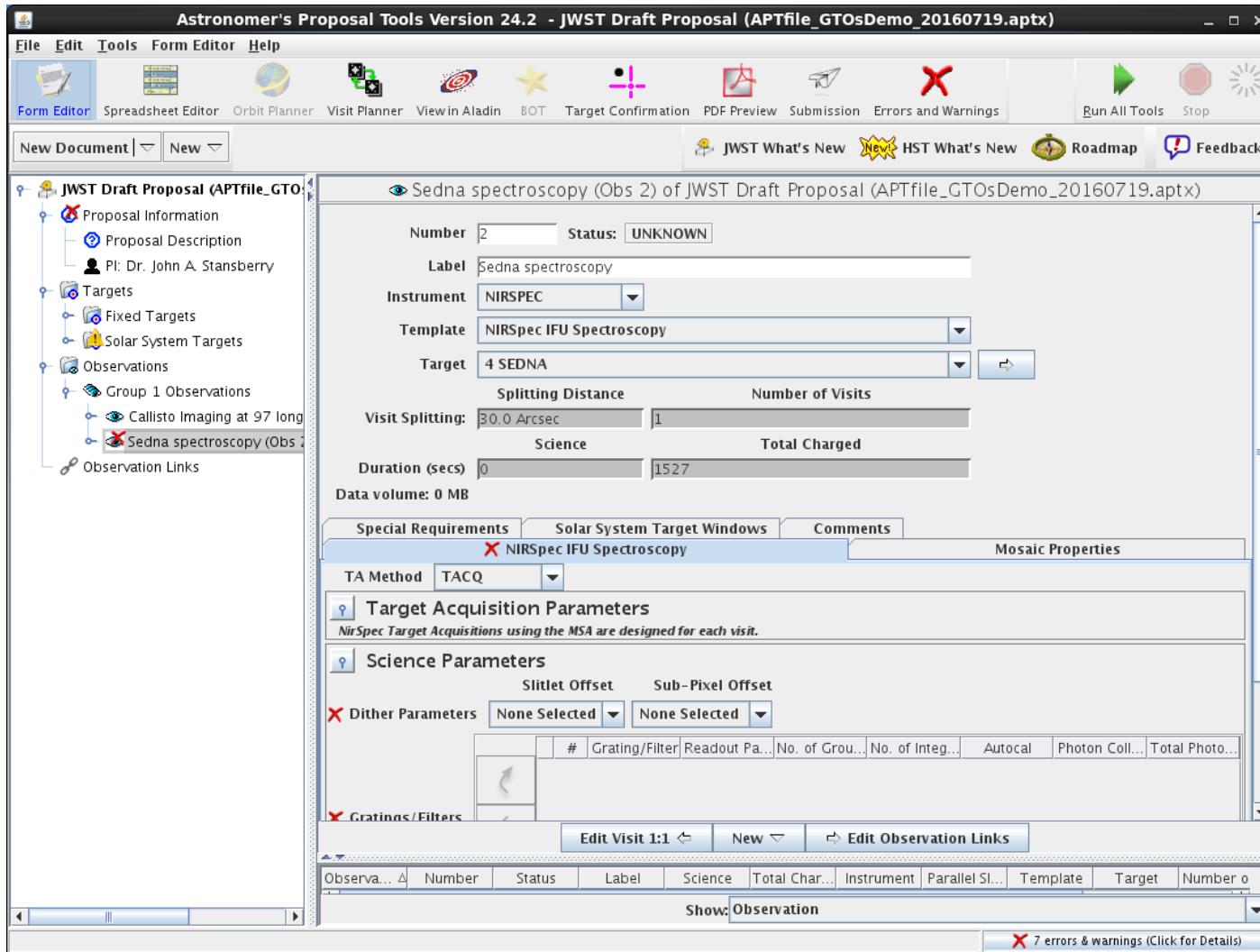
# NIRCam Intramodule Dithers



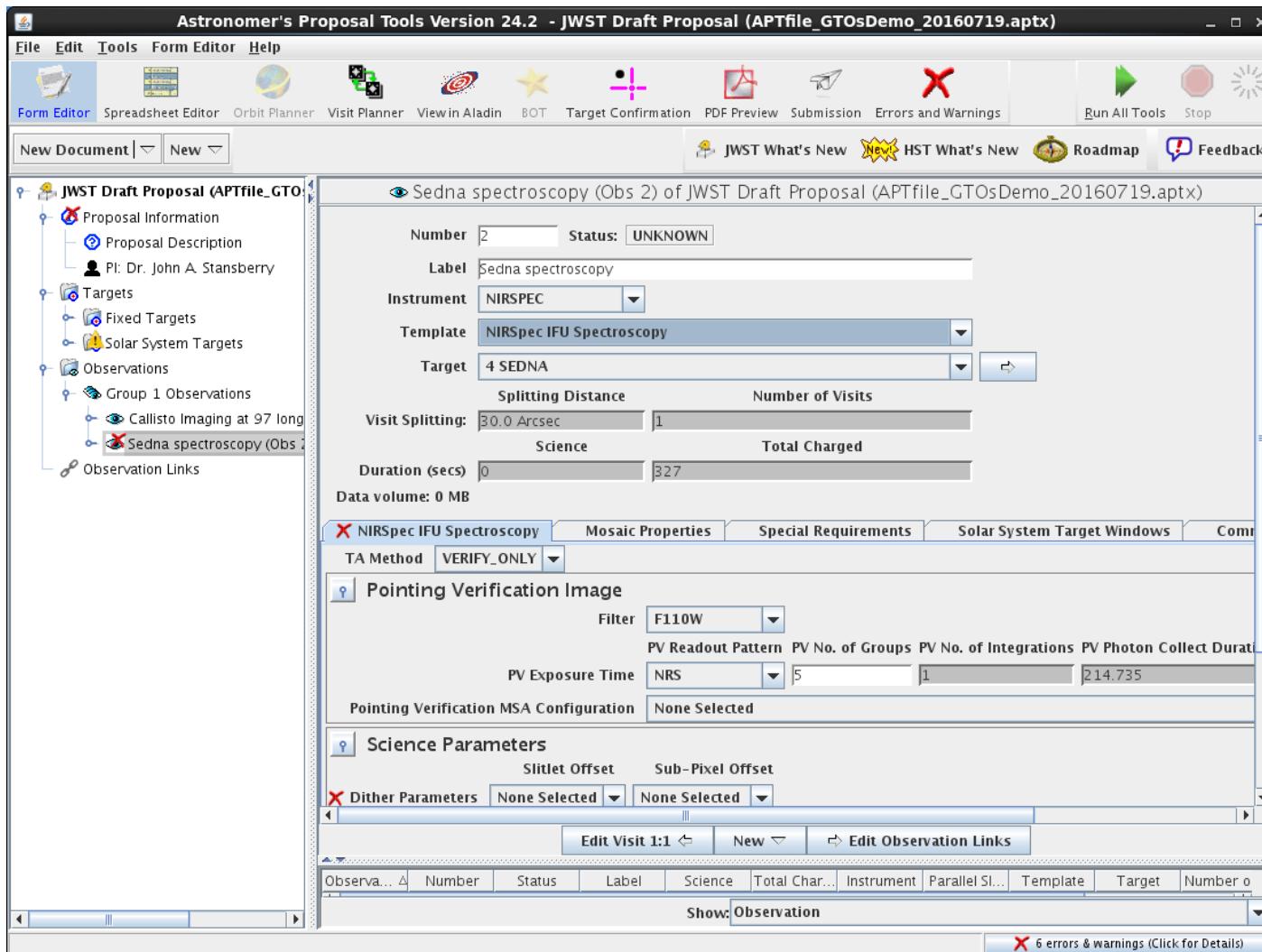
# Template Example: NIRSpec IFU Spectroscopy

## **APT TUTORIAL**

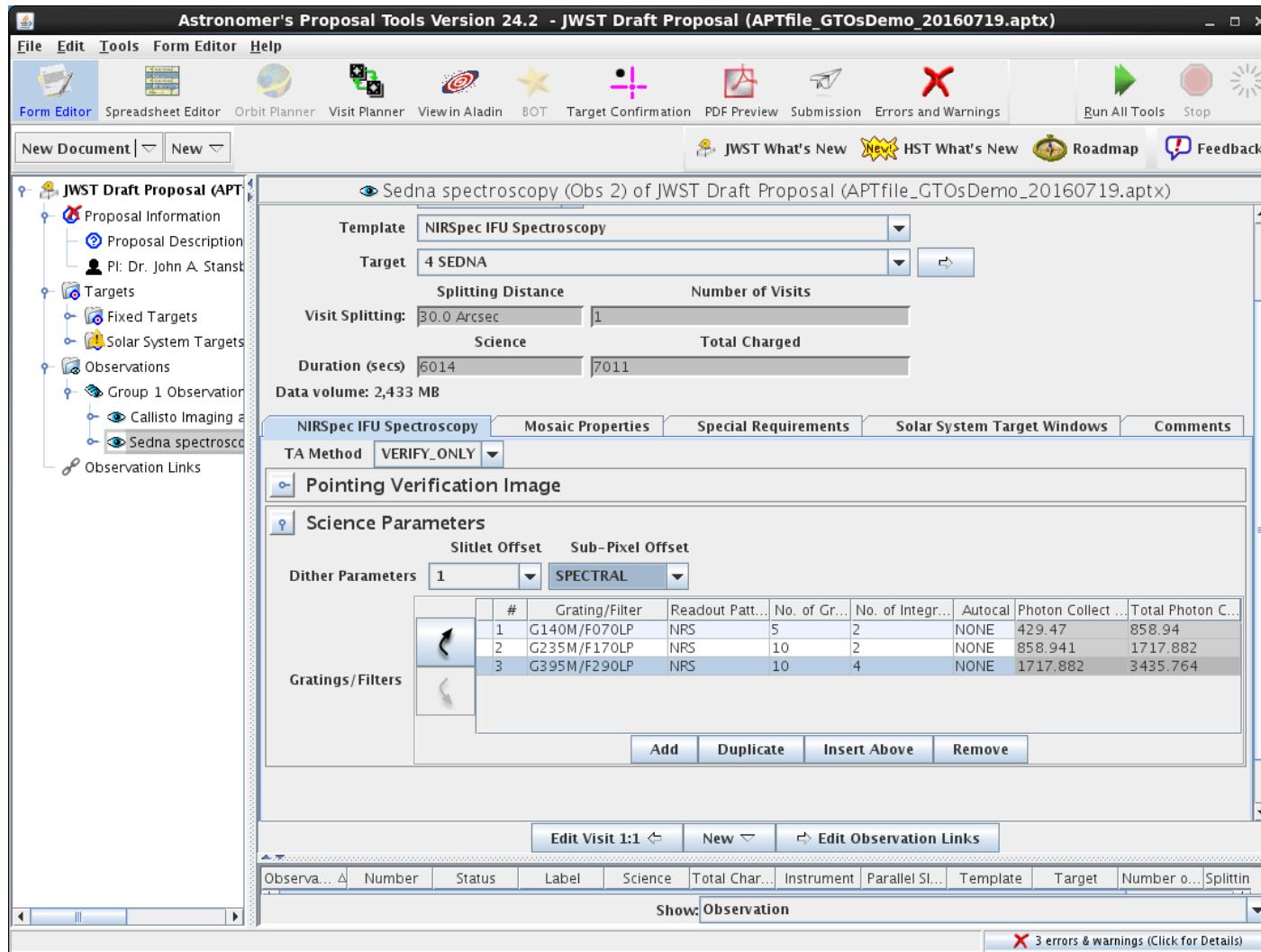
# NIRSpec IFU Spectroscopy Template



# IFU Target Acquistion: Not Yet Implemented



# NIRSpec IFU: 0.7 – 5 μm at R = 1000



# NIRSpec Target-Acq: Mock-up using NIRISS

Astronomer's Proposal Tools Version 24.2 - JWST Draft Proposal (APTfile\_GTOsDemo\_20160719.aptx)

File Edit Tools Form Editor Help

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

New Document New

JWST What's New HST What's New Roadmap Feedback

**JWST Draft Proposal (APT)**

- Proposal Information
- Proposal Description
- PI: Dr. John A. Stansberry
- Targets
  - Fixed Targets
  - Solar System Targets
    - 2 2014MU69
    - 3 CALLISTO-LONI
    - 4 SEDNA
- Observations
  - Group 1 Observation
  - Callisto Imaging a
  - Sedna spectroscopic
- TargAcq Example
- Sedna Target-Acq
- Observation Links

**Sedna Target-Acq mock-up w/ NIRISS AMI Template (Obs 3) of JWST Draft Proposal (APTfile\_GTOsDemo\_20160719.aptx)**

Number: 3 Status: UNKNOWN  
Label: Sedna Target-Acq mock-up w/ NIRISS AMI Template  
Instrument: NIRISS  
Template: NIRISS Aperture Masking Interferometry  
Target: 4 SEDNA  
Splitting Distance: Number of Visits  
Visit Splitting: 30.0 Arcsec 1  
Duration (secs): Science Total Charged  
860 2015  
Data volume: 169 MB

**NIRISS Aperture Masking Interferometry** **Special Requirements** **Solar System Target Windows** **Comments**

**Target Acquisition Parameters**

Target ACQ	SAME TARGET AS OBSERVATION	Acq Mode	AcqFilter	Acq Flux
Acq Readout Pattern	Acq No. of Groups	Acq No. of Integrations	Acq Photon Collect Duration	
Acq Exposure Time	NIRRAPID	19	1	0.864

**AMI Parameters**

Primary Dithers Subpixel Positions

Dither	NONE	4				
Subarray	FULL					
#	Filter	Readout Pattern	No. of Groups	No. of Integrati...	Photon Collect ...	Total Photon Co...
1	F480M	NIS	5	1	214.735	858.94

Edit TargAcq Example New Edit Visit 3:1

3 errors & warnings (Click for Details)

# NIRSpec Target-Acq: Mock-up using NIRISS

Astronomer's Proposal Tools Version 24.2 - JWST Draft Proposal (APTfile\_GTOsDemo\_20160719.aptx)

File Edit Tools Form Editor Help

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

New Document | New Solar System Target JWST What's New HST What's New Roadmap Feedback

JWST Draft Proposal (APT)

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- PI: Dr. John A. Stansberry
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  - Solar System Targets
    - 2 2014MU69
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    - 4 SEDNA
- Observations
  - Group 1 Observation
  - Callisto Imaging
  - Sedna spectroscopic
- TargAcq Example
- Sedna Target-Acq
- Observation Links

4 SEDNA of JWST Draft Proposal (APTfile\_GTOsDemo\_20160719.aptx)

Number: 4  
Name in the Proposal: SEDNA  
Keyword: DWARF-PLANET  
Description: Sedna, as in the TNO...

Level 1 Type: Asteroid    Level 2 Type: None Selected    Level 3 Type: None Selected

Summary: Level 1: TYPE=ASTEROID, A=487.8063356662295, E=.8440634981718848, I=11.92970366981683, O=144.4364498019875, W=311.5713338294754, M=357.662822379051, EQUINOX=J2000, EPOCH=19-SEP-2006:00:00:00, EpochTimeScale=TDB

Acquisition Fluxes  
Enter Flux data for Instruments that need to know the Flux of this Target through the Acquisition filter

Instrument	Acquisition Filter	Flux Value (micro-Jy)
NIRISS	F480M	1.0

Acq Fluxes

Add Duplicate Remove

Comments

Edit PGraphic Level 3 for 3 CALLISTO-LON97 ← New ↗ Edit Asteroid Level 1 for 4 SEDNA

✗ 3 errors & warnings (Click for Details)

HST Moving-target features  
that have not yet come to  
pass for JWST...

## **APT TUTORIAL**

# APT: Table of Observing Circumstances

Astronomer's Proposal Tools Version 22.2.1 – HST Phase II Proposal 19864 (Unsaved)

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

New Document Phase II->I New JWST Readme What's New? Roadmap Feedback

HST Phase II Proposal 19864 (Uns.)

- Proposal Information
- Targets
  - Solar System Targets
    - 1 2014S4-GIBBS
- Patterns
- Visits
  - Visit 01
  - Visit 02
    - Exposure 1 (Visit 02)
    - Exposure 2 (Visit 02) (Selected)

Exposure 2 (Visit 02) of HST Phase II Proposal 19864 (Unsaved)

Instrument Parameter(s)  
CR-SPLIT=NO

Optional Parameters

Add Remove Edit

Ephemeris Generation (required only for Aladin and BOT)

Ephemeris Center: EARTH

Start: [ ]

End: [ ]

Step Size: [ ] Days

All fields required

Generate Ephemeris

No Ephemeris Obtained

Edit Exp 1Copy 3 New Edit Exposure 2 (Visit 02) special requirements

Exposure	Number	Label	Config	Target	Mode	Spectral El...	Polarizer	Crossed Fil...	Aperture	Wavelength	Wave
Exposure ...	1		WFC3/UVIS	1 2014S4...	ACCUM	F350LP			UVIS2		
Exposure ...	2		WFC3/UVIS	1 2014S4...	ACCUM	F350LP			UVIS2		

Show: Exposure

No errors & warnings (Click for Details)

# APT: Table of Observing Circumstances

Astronomer's Proposal Tools Version 22.2.1 – HST Phase II Proposal 19864 (Unsaved)

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

New Document Phase II->I New

JWST Readme What's New? Roadmap Feedback

**HST Phase II Proposal 19864 (Uns)**

- Proposal Information
- Targets
  - Solar System Targets
    - 1 2014S4-GIBBS
- Patterns
- Visits
  - Visit 01
  - Visit 02
    - Exposure 1 (Visit 02)
    - Exposure 2 (Visit 02)**

**Exposure 2 (Visit 02) of HST Phase II Proposal 19864 (Unsaved)**

Ephemeris Center: HUBBLE

Start: 28-OCT-2014:00:00:00

End: 29-OCT-2014:00:00:00

Step Size: 1.6 Hours

All fields required

Generate Ephemeris

**Ephemeris Obtained** Click the "View in Aladin" button on top menu to visualize

Date Obtained: Fri Oct 31 01:06:58 GMT 2014

Ephemeris Center: HUBBLE

Start Date: 2014-OCT-28 00:00:00.0

End Date: 2014-OCT-29 00:00:00.0

Step Size: 1.6 Hours

Start Position: 00:52:49.0613 -13:31:25.30

End Position: 00:52:16.7409 -13:30:6.90

**View Ephemeris Table**

Edit Exp 1Copy 3 New Edit Exposure 2 (Visit 02) special requirements

Exposure	Number	Label	Config	Target	Mode	Spectral El...	Polarizer	Crossed Fil...	Aperture	Wavelength	Wavele
Exposure ... 1			WFC3/UVIS	1 2014S4...	ACCUM	F350LP			UVIS2		
Exposure ... 2			WFC3/UVIS	1 2014S4...	ACCUM	F350LP			UVIS2		

Show: **Exposure**

# APT: Table of Observing Circumstances

Astronomer's Proposal Tools Version 23.2 pr77524 (Mon Apr 27 2015) – Unsubmitted HST Phase II Proposal (Unsaved)

New HST Proposal | New HST Proposal | Phase II-> | New | Run All Tools | Stop | JWST What's New | HST What's New? | Roadmap | Feedback

Unsubmitted HST Phase II Proposal

- Proposal Information
- Proposal Description
- Unnamed PI
- Unnamed Col

Targets

- Solar System Targets
- 1 MYCOMET
- Comet Level 1 for 1 M

Patterns

Visits

- Visit 01
  - My Comet Exposure (01.0)

Optional Parameters

Use Default Time  ETC Run #

Click Add button below to create a new entry

Moving Target Ephemeris

Ephemeris Center

Date Obtained: 2015-APR-01 00:00:00.0

Ephemeris Center: 1 MYCOMET

Start Date: 2015-APR-01 00:00:00.0

End Date: 2015-APR-02 00:00:00.0

Step Size: 1 day

Start Position: J2000

End Position: J2000

Comments

OK

My Comet Exposure (01.001) of Unsubmitted HST Phase II Proposal (Unsaved)

ETC Run #

Click Add button below to create a new entry

Ephemeris

Date	RA	Dec	Distance (AU)
2015-APR-01 00:00:00.0	17 10 19.5507	+44 59 44.35	2.146
2015-APR-01 06:00:00.0	17 09 39.3144	+45 08 24.32	2.147
2015-APR-01 12:00:00.0	17 08 58.7484	+45 17 2.61	2.148
2015-APR-01 18:00:00.0	17 08 17.8518	+45 25 39.18	2.148
2015-APR-02 00:00:00.0	17 07 36.6238	+45 34 13.99	2.149

Comments

Edit Visit 01 | New | Edit Exposure 1 (Visit 01) special requirements

Exposure	Number	Label	Config	Target	Mode	Spectral El...	Polarizer	Crossed Fil...	Aperture	Wavelength	Wavelength	No. Of Iter...	Exposure ...	Use Default...
My Comet...	1	My Comet...	WFC3/UVIS	1 MYCOMET ACCUM	F218W					UVIS		1	5 Secs	<input type="checkbox"/>

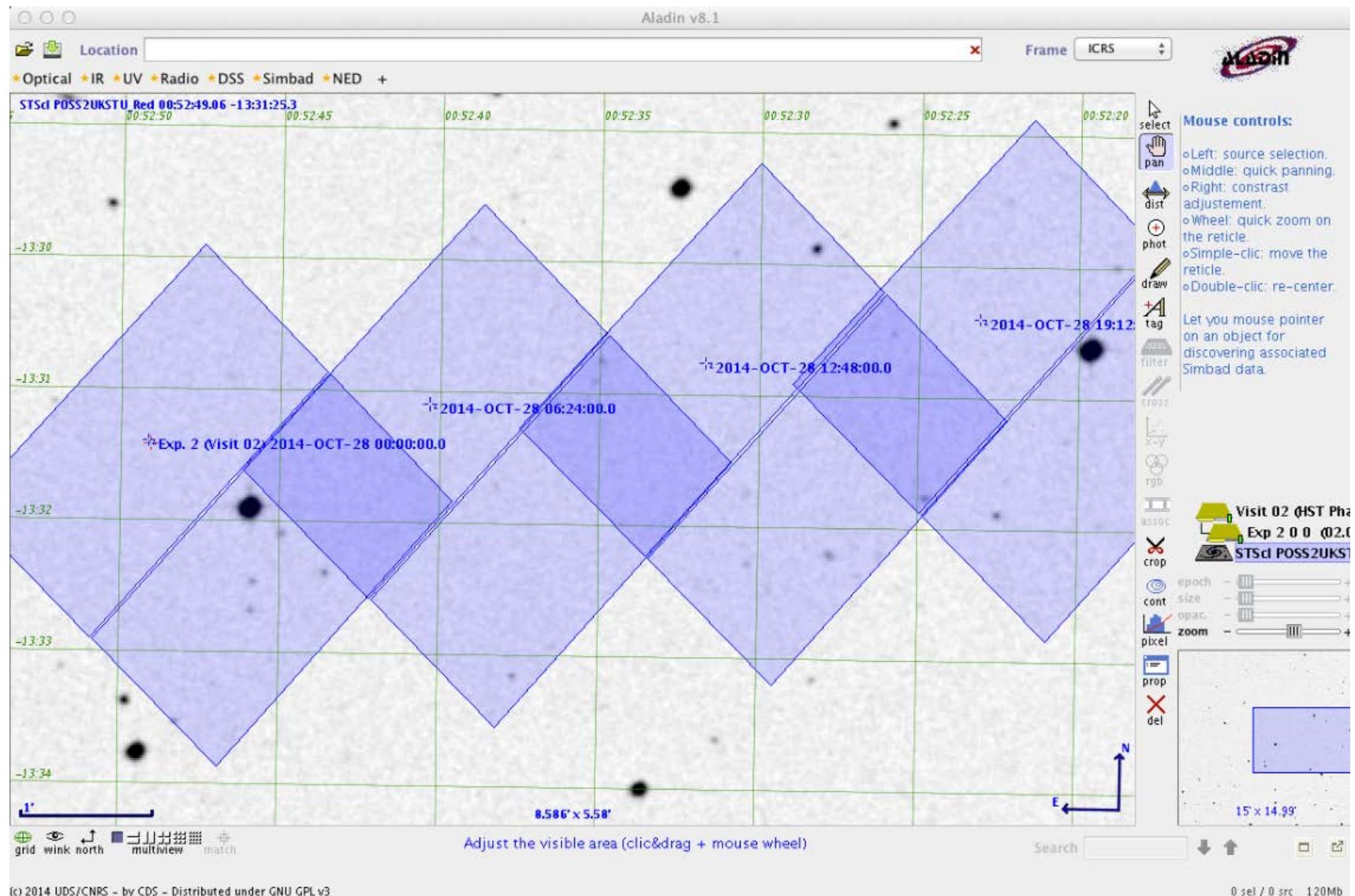
Show: Exposure

6 errors & warnings (Click for Details)

The screenshot shows the APT software interface for creating an HST proposal. On the left, a tree view lists the proposal structure, including targets like '1 MYCOMET'. In the center, a dialog box titled 'My Comet Exposure (01.001)' displays ephemeris data for the comet. The data table shows the comet's position over time from April 1 to April 2, 2015, in J2000 coordinates. The software interface includes various toolbars, status bars, and a bottom panel showing exposure parameters.

- Additional output fields are in the works.
- Data can be saved to text file.

# APT: Moving Target Visualization



# Backup

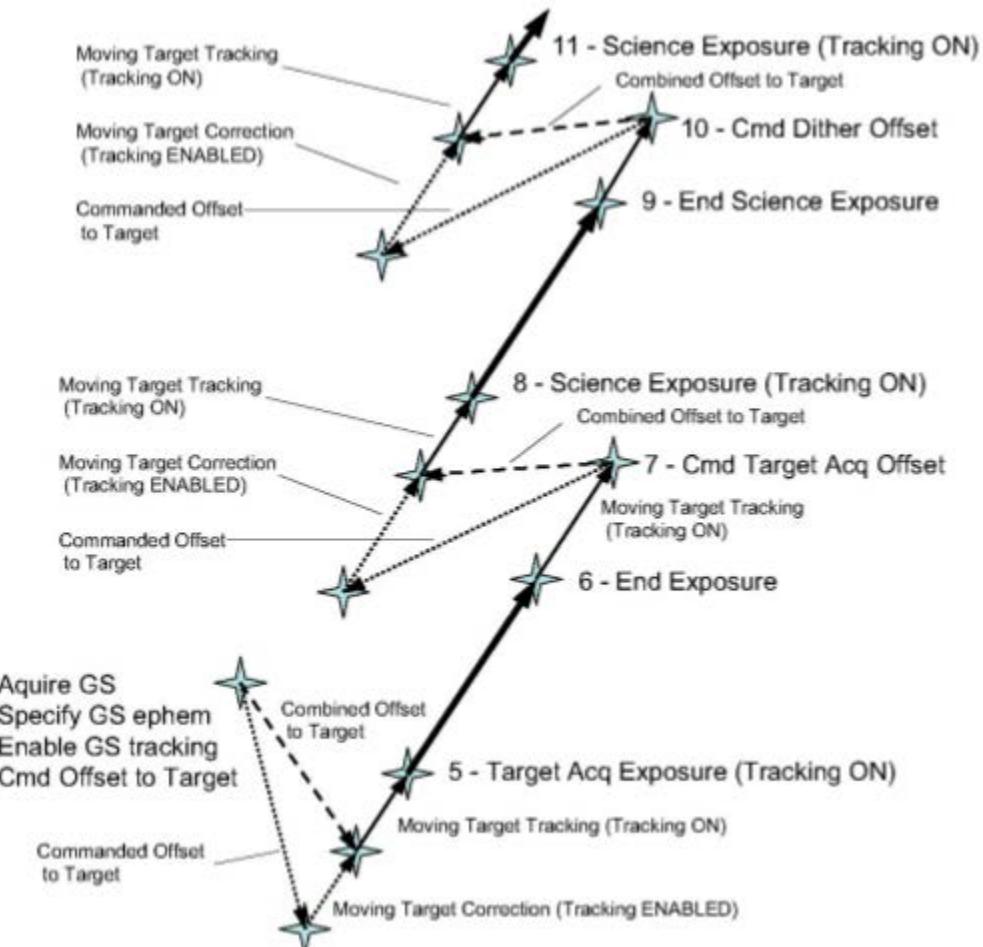
# HST/JWST Differences

- HST:
  - HST APT is a highly mature observer's tool-box
  - Very flexible, unconstrained observation design
  - 'Orbits' are the quantum of scheduling and time allocation
  - Observing plan is a sequence of steps each required to occur at a specific time
    - Scheduling is a rigorous process of determining the sequence and times
- JWST:
  - JWST APT has flexible but circumscribed 'templates' for observation design
  - 'Observations' are the quantum of science, time is allocated in hours
    - Visits are the quantum of scheduling (series of activities using 1 guide star)
  - Observing plan is a sequence of visits, and activities within visits
    - Execution is 'event driven', allows visits to be skipped-over if they can't be executed when the observatory finishes previous visit

# ACS Operations Concept for Moving Targets

- On-board Scripts Subsystem (OSS) – ACS Interactions
  - Dithers, maps
    - Offset sent to ACS at end of exposure
    - ACS moves track box to offset + predicted ephemeris motion
  - Target-acq
    - SI data analyzed by OSS
    - Offset sent to ACS
    - ACS moves track box to offset + predicted ephemeris motion

MT Target Acq and Dither Schematic  
JWST-RPT-009982



# How Fast are Moving Targets Moving?

