



# JWST Proposal Planning Tools

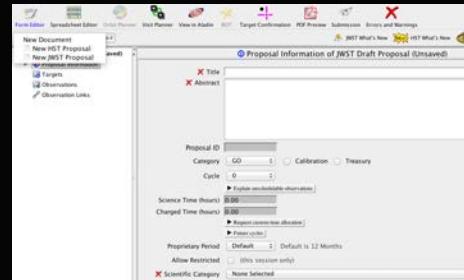
Klaus Pontoppidan  
JWST Deputy Project Scientist, STScI

JSTUC, STScI, 9/15/2017

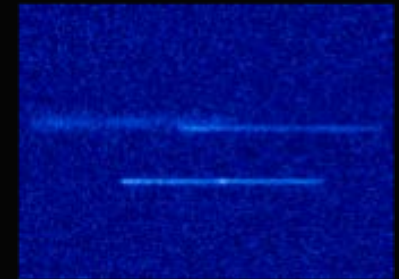
# Proposal Planning Tools

- **Astronomer's proposal tool (APT)**
  - APT 25.4 due for release with GO-1 CFP
- **Visibility tools**
  - General Target Visibility Tool (GTVT)
  - Coronagraphic Visibility Tool (CVT)
- **Exposure time calculator (ETC)**
  - Pandeia, beta version released summer 2016
  - Version 1.0 release at the winter 2017 AAS
  - Now version 1.2
- **JWST Background Tools**
  - Access to full JWST backgrounds model - to be released
- **Data simulator**
  - STIPS imaging modes - to be released
- **User documentation (JDOX, see LaMassa talk)**
  - Wikipedia-style integrated web documentation
- **New JWST help desk**
  - Modern web portal integrated with JDOX. Includes knowledge base (quick articles based on responses to help calls)

APT



JWST ETC



JDOX



Help Desk



# ASTRONOMERS PROPOSAL TOOL (APT)

APT 25.2.3 latest release - <http://apt.stsci.edu>

## Supported in APT 25

- All science observing modes
- NIRSpec Multi-Object Spectroscopy Planner
- Coordinated parallel observations:
  - NIRCам + MIRI Imaging
  - NIRCам Imaging + NIRISS WFSS
  - MIRI Imaging + NIRISS WFSS
  - NIRCам + NIRISS Imaging

## APT 25.0

- DD-ERS Notice of Intent/GTO target selection
- January 26, 2017

## APT 25.1

- GTO proposals
- NIRSpec MSA + NIRCам imaging coord. parallels
- June 1, 2017

## APT 25.2.X

- Used for DD-ERS proposals
- June 1, 2017

## APT 25.4

- GO Cycle I proposals
- November, 2017



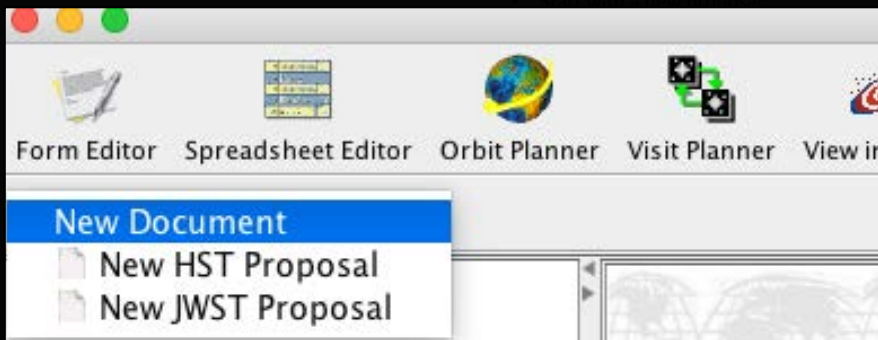
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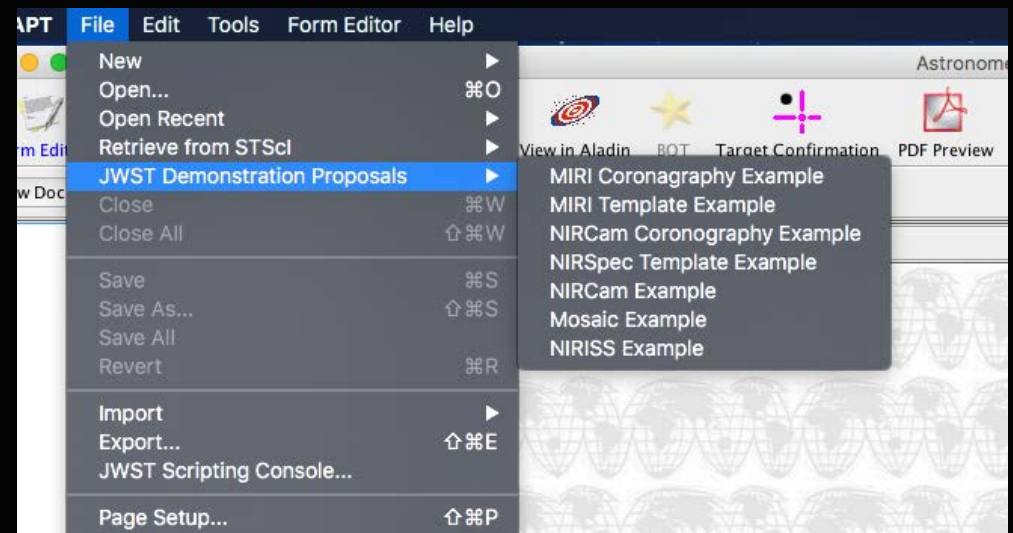
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# JWST IN APT: FAMILIAR TO USERS OF HST APT

Where to find JWST



Use one of the demonstration proposals



# ASTRONOMER'S PROPOSAL TOOL (APT)

## CREATE YOUR JWST OBSERVATIONS

Observation structure



Observation 1 of JWST Approved Proposal 6 (Unsaved)

Number: 1 Status: IMPLEMENTATION

Label: [Empty]

Instrument: NIRCAM

Template: NIRCam Imaging

Coordinated Parallel: [Empty]

Target: 1 M83

Visit Splitting: 55.0 Arcsec

Duration (secs): Science: 10080 Total Charged: 28202

Data volume: 42,279 MB

Module: ALL

Subarray: FULL

Dither Parameters: INTRAMODULE 3 1

#	Short Filter	Long Filter	Readout Pattern	No. of Groups	No. of Integrations	Photon Collect Durat...	Total Photon Collect...
1	F162M+F150W2	F410M	BRIGHT1	5	1	96.631	289.893000000000...
2	F164N+F150W2	F405N+F444W	BRIGHT1	8	2	322.103	966.309

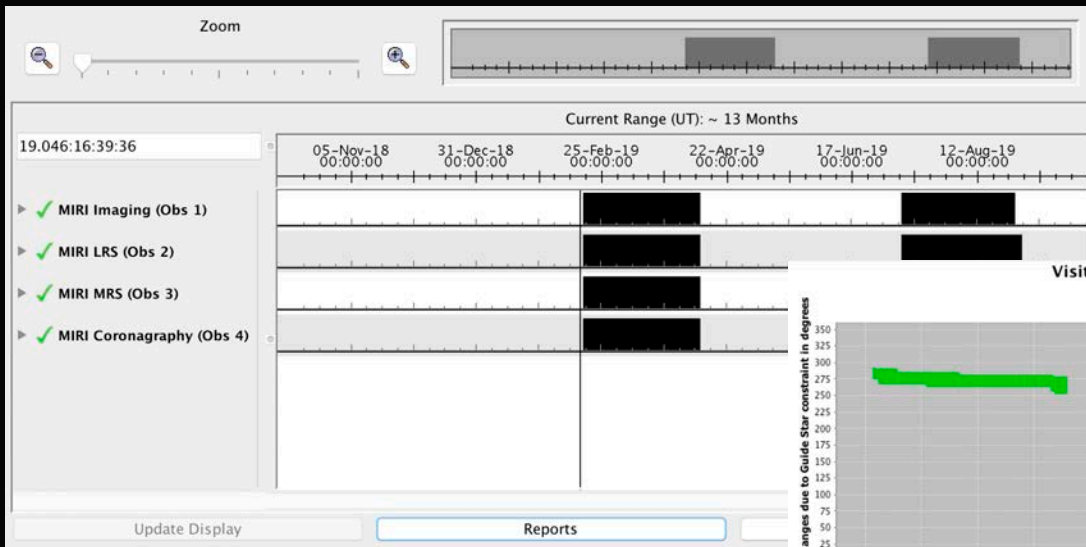
Template+Target Choice



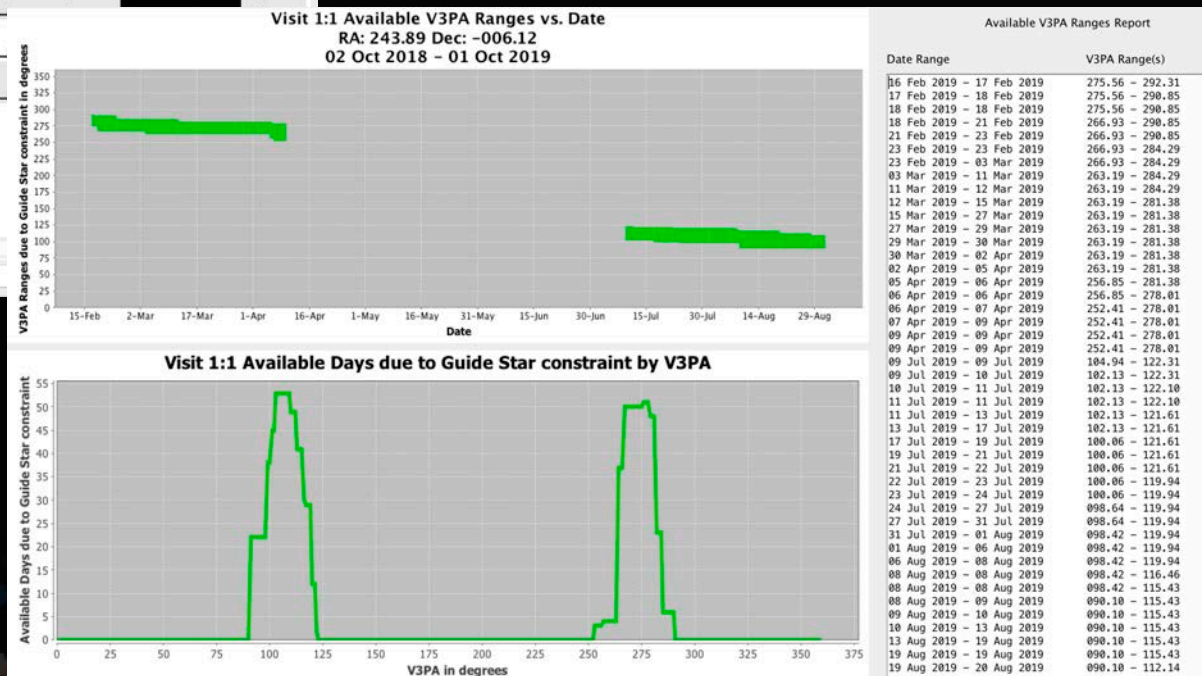
Exposure+Dither information



# JWST SCHEDULABILITY WITH APT



Explore target visibility



And guide star availability



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# APT FEATURES

## Parallel modes

Number  Status: UNKNOWN

Label

Prime Instrument

Template

Coordinated Parallel

Target  None Selected

Splitting Distance	Number of Visits
Visit Splitting: <input type="text" value="5.0 Arcsec"/>	<input type="text" value="1"/>
Science	Total Charged
NIRCam Imaging Duration (secs) <input type="text" value="0"/>	<input type="text" value="2711"/>
MIRI Imaging Duration (secs) <input type="text" value="0"/>	

## Overhead model (see Valenti talk)

Proposal ID  STScI Edit Number

Category   Calibration  Treasury

Pure Parallel Proposal

Cycle

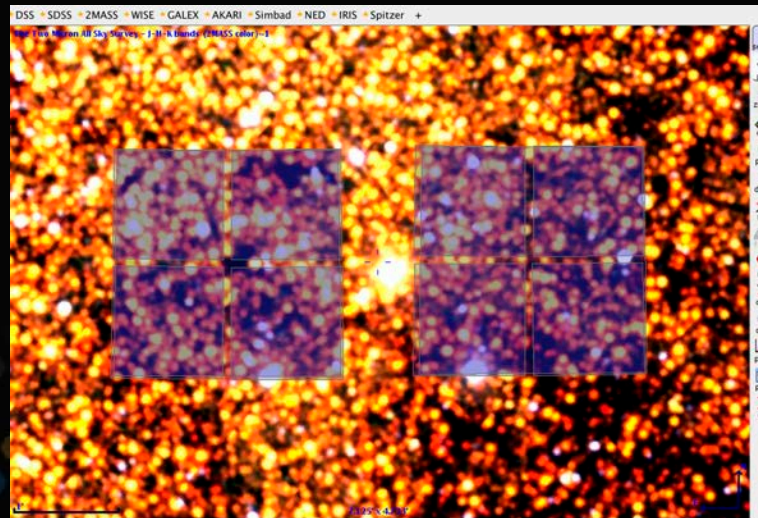
Science Time (hours)

Charged Time (hours)  Allocated Time (hours)

Proprietary Period  Default is 12 Months

Allow Restricted  (this session only)

Interface with  
Aladin



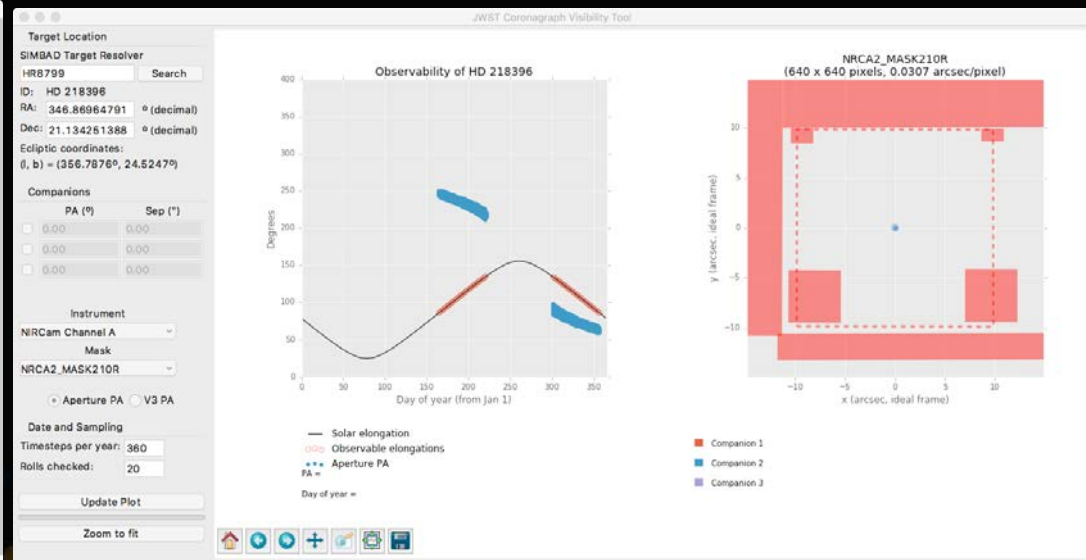
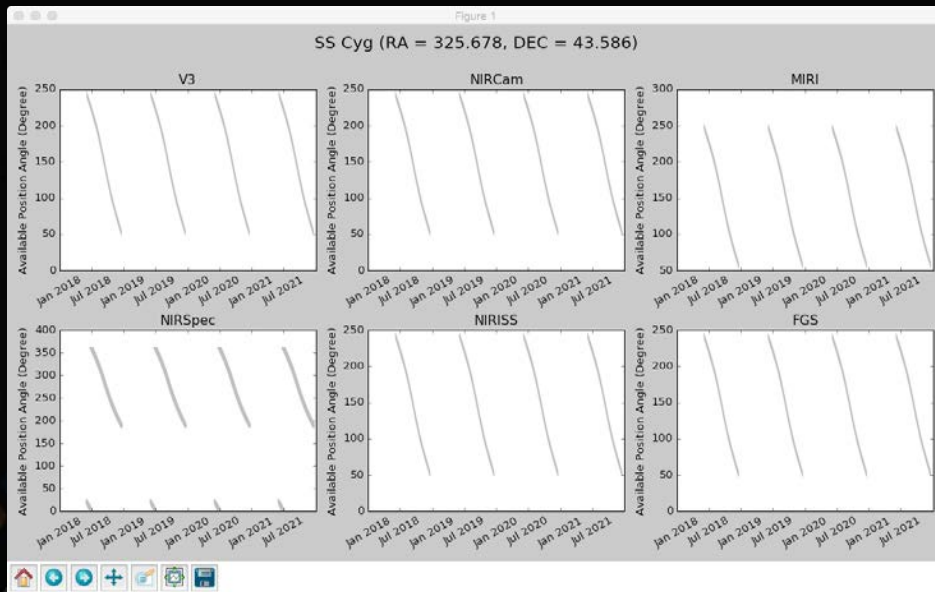
# JWST TARGET VISIBILITY TOOLS

## General Target Visibility Tool

- Python module
- Installable from github or pip
- Displays visibility and position angles as a function of time for all instruments

## Coronagraphic Visibility Tool

- Also python module, but offers a GUI
- Installable from github or pip
- Helps plan where faint companions will be visible on coronagraph fields of view.



# JWST EXPOSURE TIME CALCULATOR

Current version 1.2

[jwst.etc.stsci.edu](http://jwst.etc.stsci.edu)

for DD-ERS/GTO/GO Cycle 1

Planned update releases (next one in November to support GO1)



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# ETC HISTORY

- Originally, it was envisioned that the JWST ETC would be similar to the HST ETC.
- It became clear that using the HST ETC as a basic design was not viable.
- Works ok for imaging, but not for most of the advanced JWST modes, JWST detector noise and to support modern user interaction and collaborations
- Something more modern/complex was needed. This was ~2012.

- **Imaging**
  - NIRCам SW+LW
  - NIRISS
  - MIRI
  - NIRSpec TA (through MSA mesh)
- **Slit spectroscopy**
  - NIRSpec FS
  - MIRI LRS
- **IFU spectroscopy**
  - NIRSpec IFU
  - MIRI MRS
- **Multi-object spectroscopy**
  - NIRSpec MSA
- **Slitless spectroscopy**
  - NIRISS WFSS
  - NIRISS SOSS
  - MIRI LRS
- **Coronagraphy**
  - NIRCам spots + wedges
  - MIRI Lyot
  - MIRI FQPMs
- **Sparse Aperture Masking Interferometry**
  - NIRISS AMI



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# THE PANDEIA SYSTEM

**ETC engine**  
Python library

**JWST reference  
database**

Separate from other  
JWST reference data

Throughputs  
noise properties  
PSFs

**Web application  
@  
jwst.etc.stsci.edu**

User interface relevant  
for most users of the  
ETC  
Collaborative  
functionality

**JWST  
Background  
Model**

Currently only available  
through the web  
application



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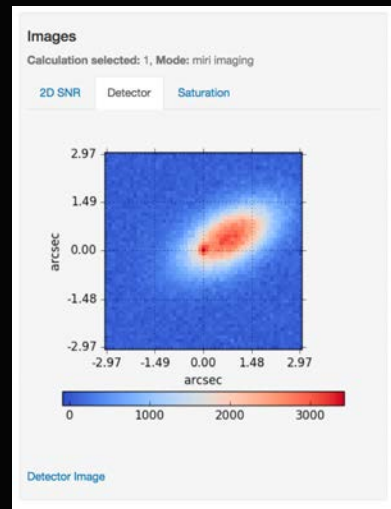
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NASA • ESA • CSA

# APPLICATION: A COLLABORATIVE WORK ENVIRONMENT

Calculations   Scenes and Sources   Upload Spectra   Caveats and Limitations

MIRI -	NIRCam -	NIRISS -	NIRSpec -				
ID -	Plot	Mode -	Scene -	(s) -	SNR -		
12	<input checked="" type="checkbox"/>	nircam sw_imaging	4	955.86	10.26		✓
10	<input type="checkbox"/>	nircam lw_imaging	4	955.86	11.50		✓
4	<input type="checkbox"/>	miri imaging	2	283.05	8.79		✓
1	<input type="checkbox"/>	niriss imaging	1	10436.17	10.37		✓
-	-	---	-	---	---	-	-



User Access Permissions for Small Body Examples for JWST Solar System London Workshop

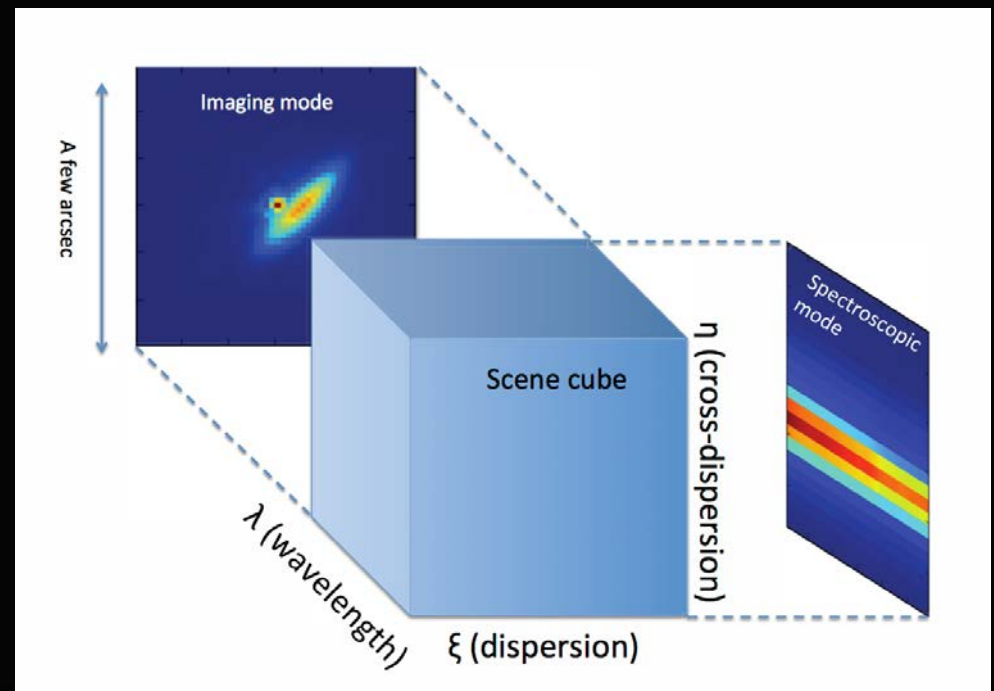
User Email  [Add User by Email](#)

User -	Read	Write	Grant	Revoke
anon_206	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

- **Workbooks: Organize and save your ETC calculations**
- **Build your own sources and scenes library**
- **Analyze and compare different instruments and modes**
- **Share your work with your team**

# ETC ENGINE

- JWST code project called “Pandea”
- Under the hood: 3D sensitivity engine
- Includes advanced PSFs, correlated noise other detector effects, effects of background subtraction and extraction.
- Pointing+time dependent JWST background model.
- 100% data driven
- Pontoppidan, Pickering, et al. 2016, SPIE



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# ETC ENGINE ALSO AVAILABLE

- Python module
- More functionality than available in the web application
- Advanced scripting
- `pip install pandeia.engine`
- <http://ssb.stsci.edu/pandeia/engine/1.0/>
- examples at <https://github.com/spacetelescope/JWSTUserTraining2016>

```
# Licensed under a 3-clause BSD style license - see LICENSE.rst
"""
Module that implements a single calculation API for the ETC3D engine
"""

from __future__ import division, absolute_import

from .etc3D import calculate_exposure_time, calculate_sn

def perform_calculation(calc_input, reverse=False, dict_report=True, webapp=True):
    """
    Function to perform a single ETC calculation

    Parameters
    -----
    input: dict
        Dictionary containing the information required to perform the calculation.
    reverse: boolean (default: False)
        Specify whether calculation is 'reverse' where a desired signal/noise is specified
        and the calculation determines an optimal ExposureSpecification to achieve it.
    dict_report: Boolean (default: True)
        If True, return a dict in engine output API format. Otherwise return
        a report.Report instance.
    webapp: Boolean (default: True)
        Toggle strict API checking for webapp
    """
```

Fun fact: The engine is a compact, general code, currently only  
~12,500 lines, excluding standard libraries.



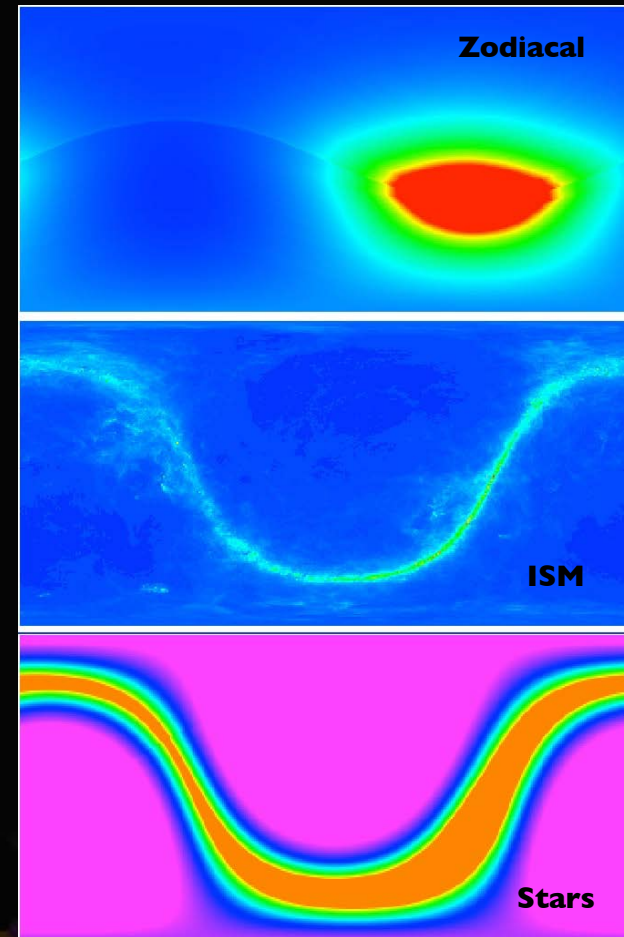
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# Zodiacal and Galactic backgrounds

- JWST uses a dynamic “background model generator” (BMG).
- Zodi+ISM heritage from Spitzer’s operational system (IPAC).
  - Data are from COBE/DIRBE.
  - ISM “cirrus” uses fixed spectrum, including PAHs. Intensity set by Schlegel et al. extinction maps, which were fits to IRAS + DIRBE/COBE data.
  - Wainscoat et al. 1998 star counts model.
- The Zodi and Galactic emission is calculated **for a given RA & DEC**, in one of 2 ways:
  1. for a given RA, DEC, date: “Dated background”
  2. as a percentile of the backgrounds for those coordinates, over the visibility. “Dateless background”
- Fun fact: Benchmark sensitivities computed for (J2000, 17:26:44 - 73:19:56) on June 19, 2019.
- Fun fact: If using the ETC engine “stand-alone”, you should still use the web app to create a background.



A. Noriega-Crespo

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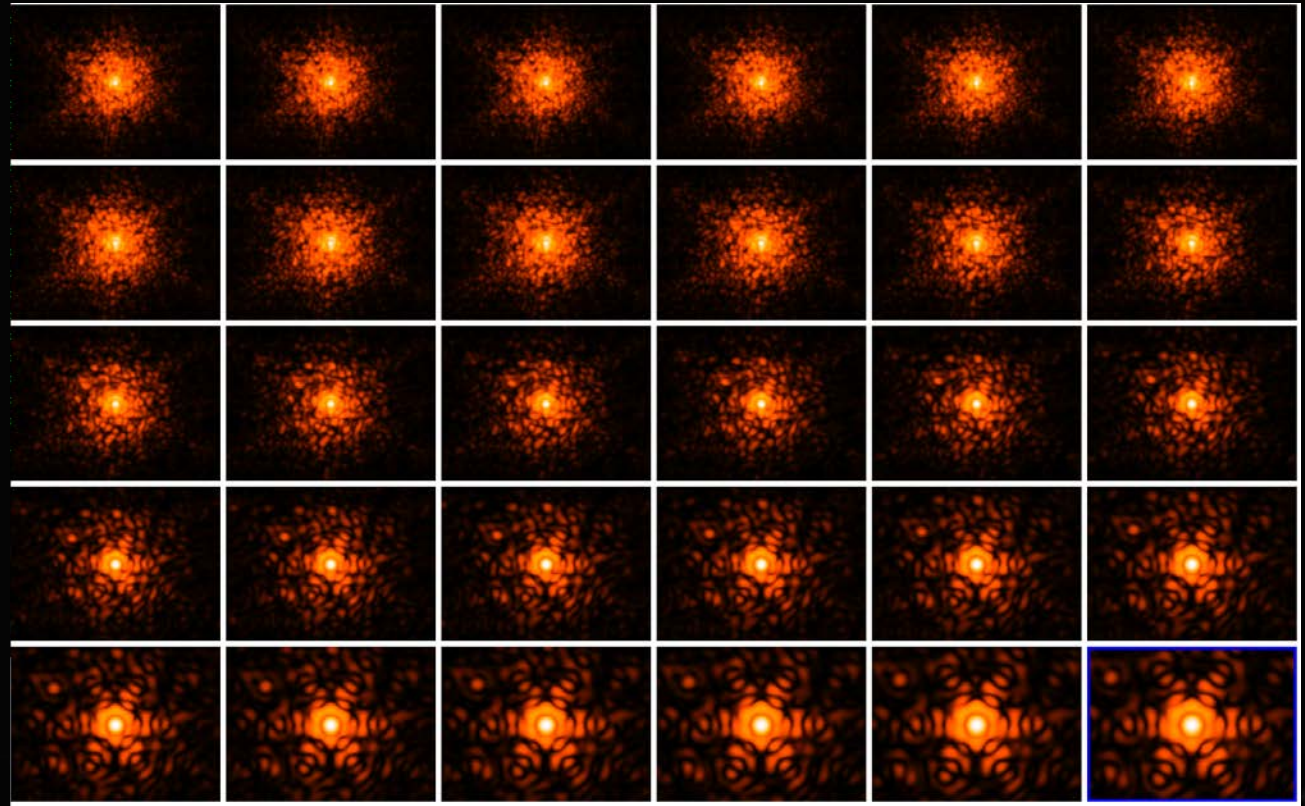


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# WEBBPSF AND PSF LIBRARY

- Uses WebbPSF to calculate theoretical point spread functions, including realistic wavefront errors. (M. Perrin, <https://pythonhosted.org/webbpsf/>).
- Almost 3000 individual monochromatic PSFs.
- Subsampled by integer factor of pixel size.
- Fun fact: The observed PSF depends on the color of the astronomical source.



NIRCam SW imaging PSFs



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Complex galaxy

An Empty Workbook

Calculations Scenes and Sources Upload Spectra Caveats and Limitations

MIRI	NIRCam	NIRISS	NIRSpec				
12	<input type="checkbox"/>	nircam sw_imaging	1	1965.42	65.73	<input checked="" type="checkbox"/>	
11	<input type="checkbox"/>	nircam sw_imaging	1	1965.42	164.41	<input checked="" type="checkbox"/>	
10	<input type="checkbox"/>	nircam sw_imaging	1	1965.42	62.03	<input checked="" type="checkbox"/>	
9	<input type="checkbox"/>	nircam sw_imaging	1	1965.42	149.27	<input checked="" type="checkbox"/>	
8	<input type="checkbox"/>	nircam sw_imaging	1	1965.42	208.45	<input type="checkbox"/>	<input type="checkbox"/>
7	<input checked="" type="checkbox"/>	nircam sw_imaging	1	1965.42	179.76	<input checked="" type="checkbox"/>	
6	<input type="checkbox"/>	nircam sw_imaging	1	1965.42	144.50	<input checked="" type="checkbox"/>	
5	<input type="checkbox"/>	nircam sw_imaging	1	1965.42	163.40	<input checked="" type="checkbox"/>	
4	<input type="checkbox"/>	nircam sw_imaging	1	1965.42	144.59	<input checked="" type="checkbox"/>	
3	<input type="checkbox"/>	niriss wfss	1	440.21	22.50	<input checked="" type="checkbox"/>	
2	<input type="checkbox"/>	nircam lw_imaging	1	1965.42	109.30	<input type="checkbox"/>	<input type="checkbox"/>
1	<input type="checkbox"/>	nircam sw_imaging	1	1965.42	100.11	<input checked="" type="checkbox"/>	
-	-	---	-	---	---	-	

Scene ★ Backgrounds Instrument Setup Detector Setup Strategy

Subarrays: FULL Readout patterns: DEEP2

Groups: 10 Integrations: 1 Exposures: 1

Exposure time: 00:32:45 (1965.42 s)

**Fun fact: You can download all the ETC inputs/outputs in a convenient format from the downloads tab**

Calculation selected: 7, Mode: nircam sw\_imaging

Reset Calculate

Images

Calculation selected: 7, Mode: nircam sw\_imaging

2D SNR Detector Saturation

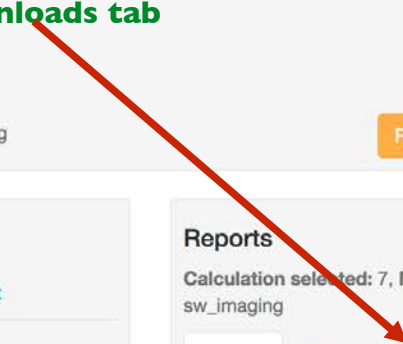
Plots

ApFlux ApBackground SNR SNR (time) Contrast

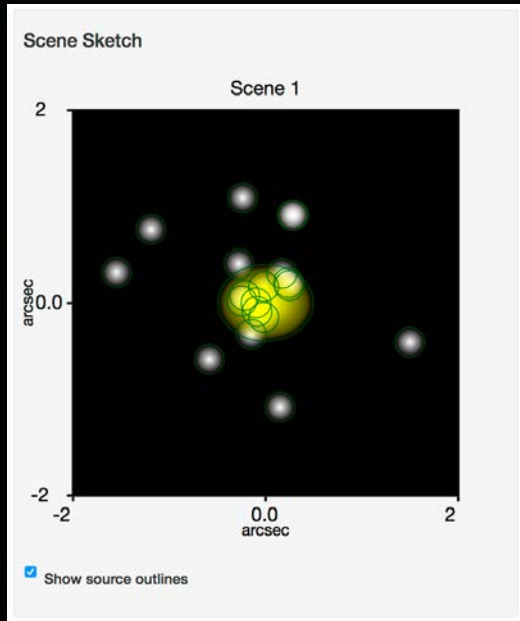
Reports

Calculation selected: 7, Mode: nircam sw\_imaging

Report Warnings Errors

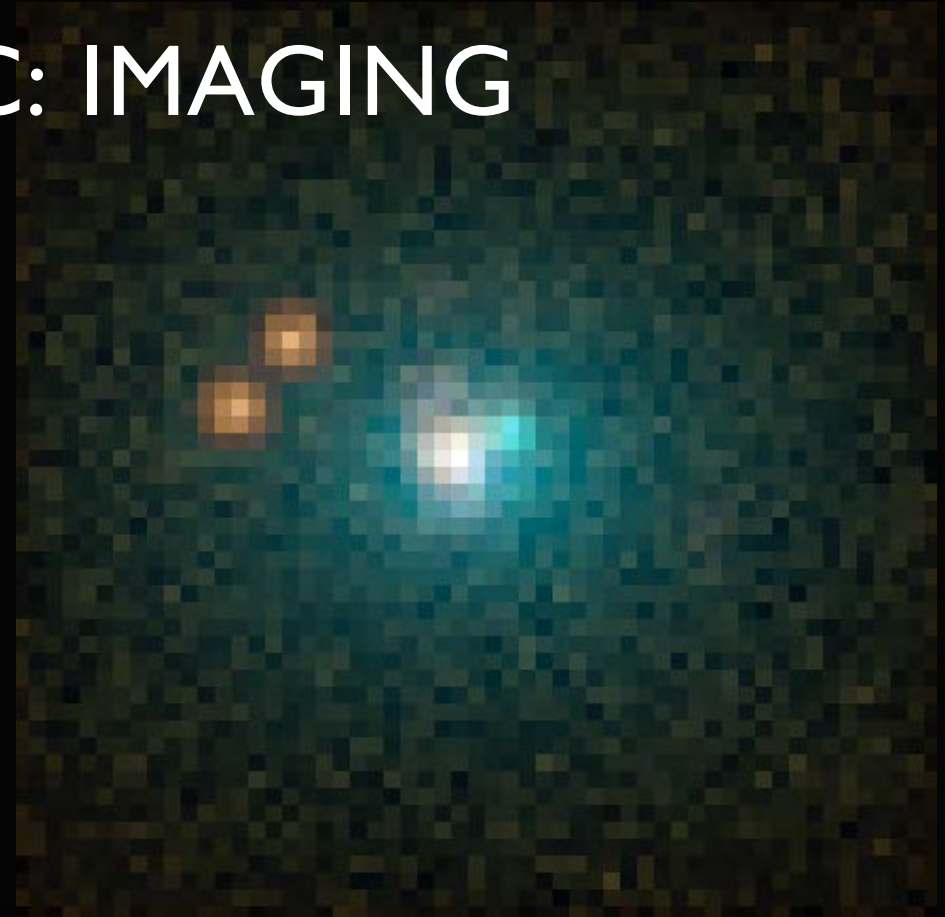


# USING THE ETC: IMAGING



NIRCam F250M/F335M/F460M

Red bulge with star-forming knots at  $z=0.5$



MIRI F560W/F770W/F1000W



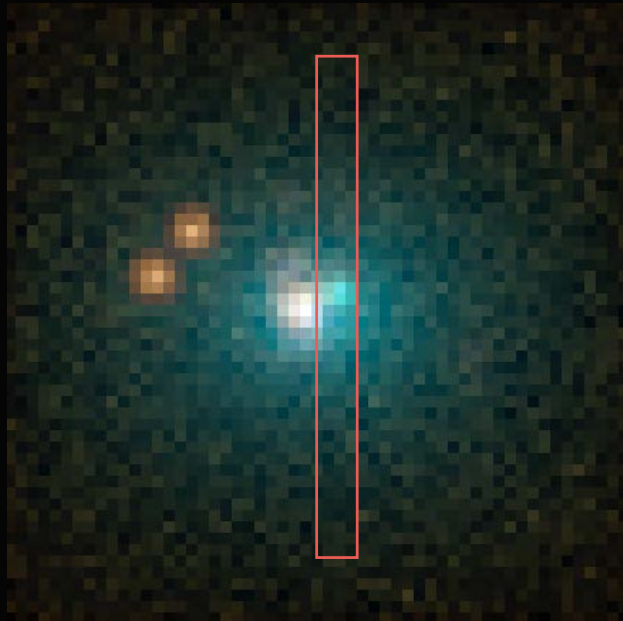
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Fun fact: You can also use the ETC python module to script complex, large scenes

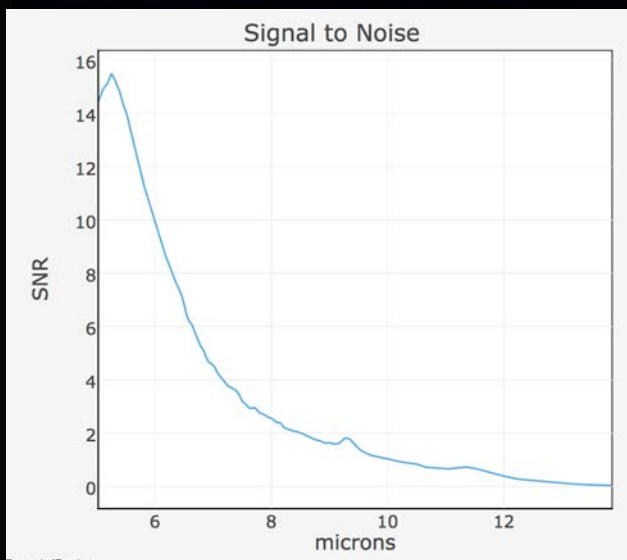


# USING THE ETC: SPECTROSCOPIC MODES

MIRI LRS



MIRI F560W/F770W/F1000W

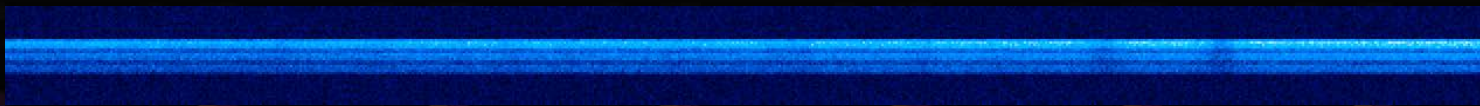


Fun fact 1: In spectroscopic modes extraction apertures are one wavelength pixel wide.

Fun fact 2: You can upload your own spectra, and add lines.



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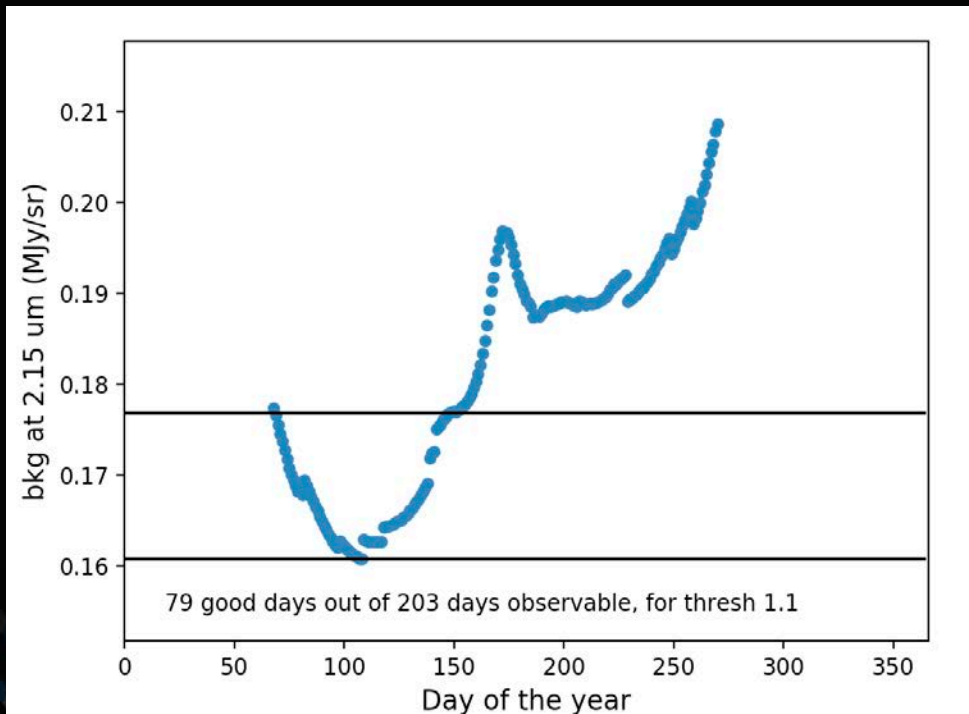
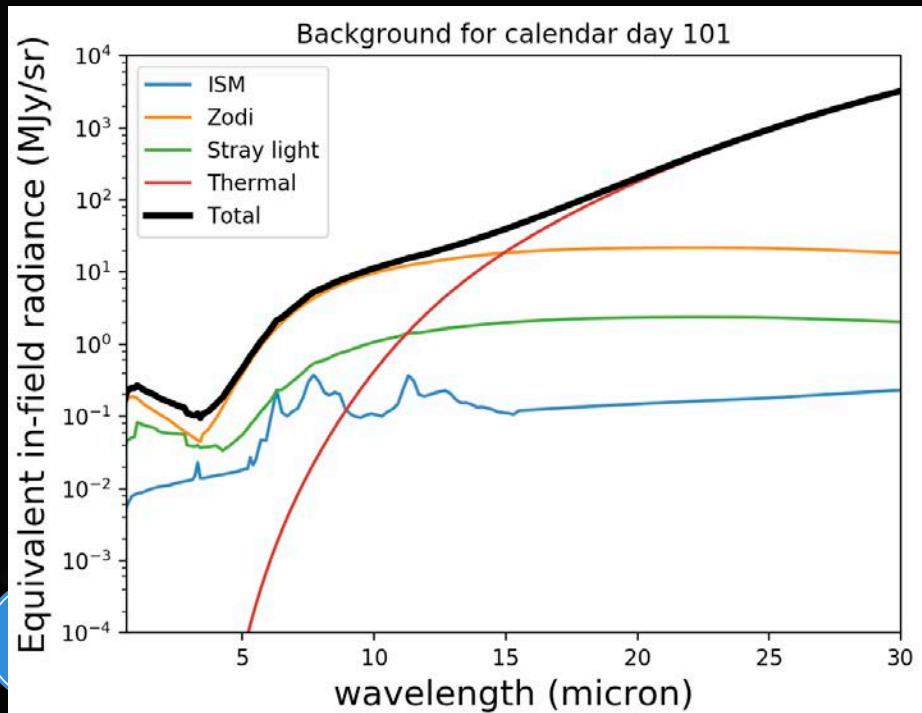


NIRSpec MSA



# THE JWST BACKGROUNDS TOOL

- Python module, to be released, based on script by J. Rigby, GSFC
- Installable from github or pip
- Displays background intensities as a function of position and time



# JWST HELP DESK

LIVE NOW: [JWSTHELP.STSCI.EDU](http://JWSTHELP.STSCI.EDU)

## Welcome to the James Webb Space Telescope Help Desk



### Request a MyST Account

Please register to gain full access to the James Webb Space Telescope Help Desk. Without an account you may still search the knowledge base but you will not be able to submit requests or questions.

#### Popular Articles

General Support FAQ  
★★★★★

Time-lapse: James Webb Space Telescope Mirror Rollover  
★★★★★

Top 10 Facts about the James Webb Space Telescope  
★★★★★

Webb Telescope Milestone: Completion of Telescope Element  
★★★★★

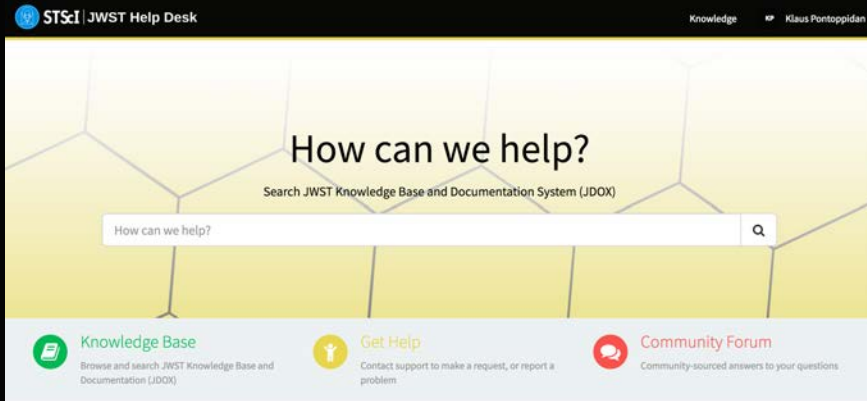
Authenticate to gain access to all features



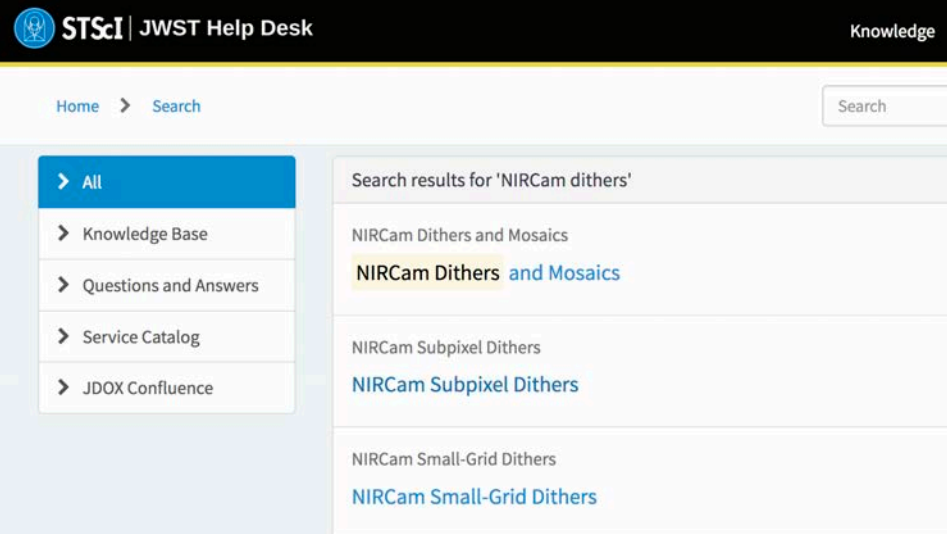
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# JWST HELP DESK FEATURES



- Supports custom workflows and submission forms (cards) for different teams.
- Handles proprietary help desk calls
- Modern backend with user-friendly tracking and search functionality
- Search integration with JDOX
- Modern user web portal ([jwsthhelp.stsci.edu](http://jwsthhelp.stsci.edu)) with 3 support “pillars”
  - Knowledge base (STScI → user)
  - Submission of help desk questions/requests (user → STScI)
  - User forum (user ↔ user)



Search of knowledge base and JDOX

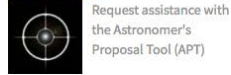


Categories

James Webb Help Desk 13

James Webb Help Desk

APT Support



Request assistance with the Astronomer's Proposal Tool (APT)

[View Details](#)

ETC Support



Request assistance with the Exposure Time Calculator (ETC)

[View Details](#)

JWST SMO Support



Request assistance for Science Policy Issues.

[View Details](#)

MAST Services



Information about the MAST Archive

[View Details](#)

MIRI Support



Request assistance with the Mid-Infrared Instrument (MIRI)

[View Details](#)

NIRCam Support



Request assistance with the Near-Infrared Camera (NIRCam)

[View Details](#)

NIRISS / FGS Support



Request assistance with the Near-Infrared Imager and Slitless Spectrograph (NIRISS)

[View Details](#)

NIRSpec Support



Request assistance with the Near-Infrared Spectrograph (NIRSpec)

[View Details](#)

Office of Public Outreach



Contact the STScI Office of Public Outreach about JWST

[View Details](#)

Operations and Scheduling



Ask questions about scheduling and operations with JWST.

[View Details](#)

Pipeline Support



Request assistance with the JWST pipeline

[View Details](#)

WebbPSF / JWST Telescope



Request assistance with the WebbPSF tool or the Telescope optical system.

[View Details](#)

JWST General Support



Request Support for the JWST Support Portal or for any other general questions.




[View Details](#)



# KNOWLEDGE BASE: FAQs INTO SHORT, SEARCHABLE ARTICLES

APT - Submission Questions KB0010395

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 Authored by Karla Peterson •  51 Views •  26d • ★★★★★

## APT - Submission Questions

**1. May I submit and then resubmit?**

Yes, you may resubmit up until the deadline. We encourage early submission because that allows you to see what submission is like (in case there are any connection issues or usability issues).

**2. May I submit with errors?**

Errors are intended to show you things that need to be fixed before submission. But there are a few errors that cannot be corrected (for example the error on using the Target Groups feature). When you submit if there are errors you will need to explain why you are submitting with the error (for instance the [jwsthelphelp.stsci.edu](http://jwsthelphelp.stsci.edu) help desk told you that this was an incorrect error).

(Please note that the text at the top of the pop with "details" of your remaining errors is HST heritage and referring to the HST APT bug list and HST help ([help@stsci.edu](mailto:help@stsci.edu)). Please always use [jwsthelphelp.stsci.edu](http://jwsthelphelp.stsci.edu) to ask questions for JWST.)





**3. How do I run Smart Accounting?**

There are two ways to run Smart Accounting - Select the Observations folder and run the Visit Planner on the entire proposal at once. Or while the Visit Planner is selected, choose from the Visit Planner menu at the top "Run Smart Accounting". For more information see the JDox articles on the [Visit Planner](#) and [Smart Accounting](#).

**4. What if I am having trouble submitting near the deadline?**

Don't panic. We can help. Go to: [jwsthelphelp.stsci.edu](http://jwsthelphelp.stsci.edu), log in with MyST credentials and choose Get Help and then APT Support.

### Also in APT

- [APT - MIRI Questions](#)  
 30 Views
- [APT - Background Target Questions](#)  
 13 Views
- [APT - Accounting](#)  
 11 Views
- [APT - Solar System target questions](#)  
 8 Views

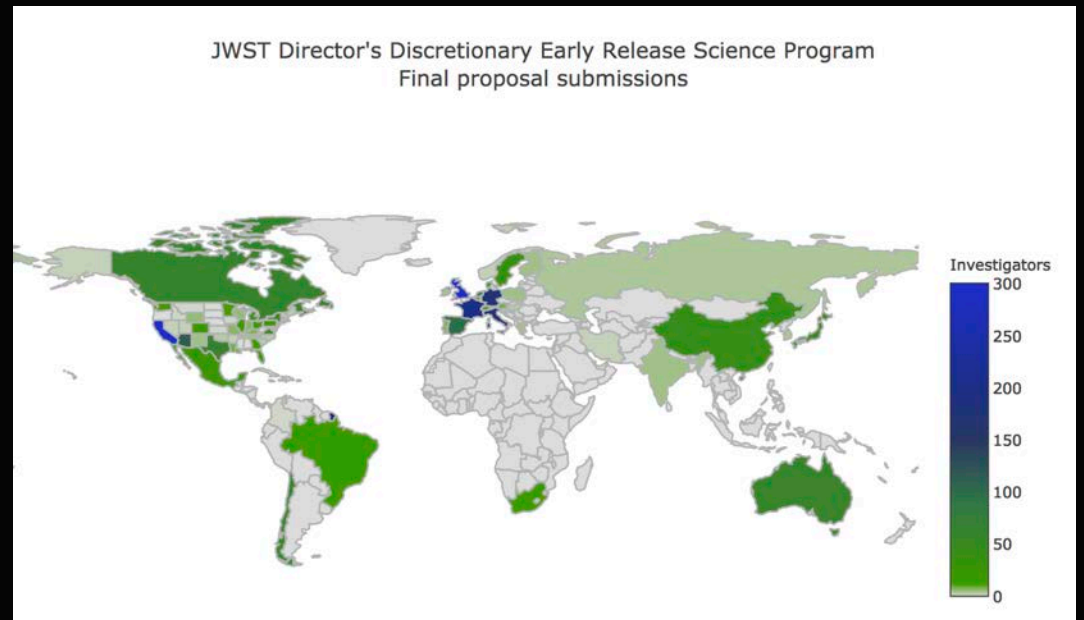
### KB Top Rated

- [General Support FAQ](#)  
★★★★★
- [Time-lapse: James Webb Space Telescope Mirror Rollover](#)  
★★★★★
- [APT - Submission Questions](#)  
★★★★★
- [APT - MIRI Questions](#)  
★★★★★



# GETTING READY FOR CYCLE I

- Proposal planning system successfully handled 106 submitted DD-ERS proposals.
- Peak ETC load of ~7000 calculations per day before ERS deadline.
- 100+ help desk calls in week before ERS.
- Extensive work to improve the system continues.



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