

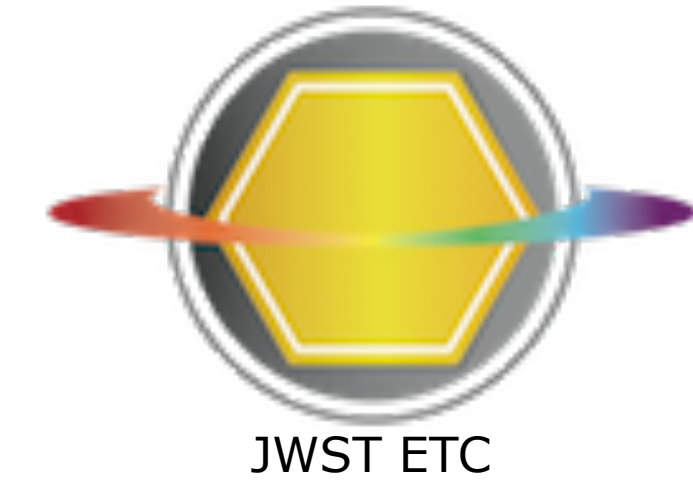
The JWST Exposure Time Calculator

Tim Rawle (ESA@STScI)

12-March-2018

The JWST Exposure Time Calculator (ETC)

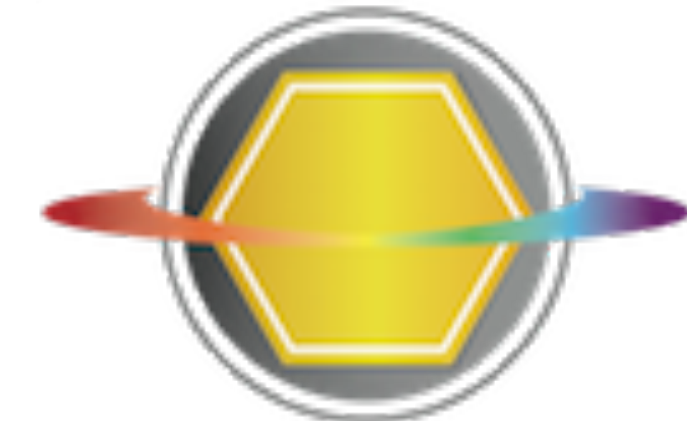
- Useful links and background reading
- Project concept and design
- Key features
- Getting started: workbook workflow
- Using ETC
 - Scenes and sources
 - Calculations
 - Batch expansions
- Known issues and considerations
- <https://jwst.etc.stsci.edu/>



The JWST Exposure Time Calculator (ETC)



- Designed and developed by **STScI**
- Generally accessed through web interface (cannot be accessed offline)
- <https://jwst.etc.stsci.edu/>
- Log in with STScI **MyST** account
- Disclaimer:
ESA works closely with the developers at STScI to strive for accuracy in instrument characteristics and performance. STScI is responsible for implementation



JWST ETC



STScI



Useful links

- **JWST ETC (v1.2 - December 2017 - version for GO Cy1)**

- <https://jwst.etc.stsci.edu/>

- **Documentation: ETC introduction and links to all pages**

- <https://jwst-docs.stsci.edu/display/JPP/JWST+Exposure+Time+Calculator+-+ETC>

- **ETC release notes, known issues and FAQ (@ JWST Help Desk)**

- https://jwsthelp.stsci.edu/?id=kb_article&sys_id=f781d8e0db318b44fb50f9baae961997

- https://jwsthelp.stsci.edu/?id=kb_category&kb_category=2ee97706db36764042685434ce961909

- https://jwsthelp.stsci.edu/?id=kb_category&kb_category=5d8affc2db36764042685434ce961998

- **JWST Community Lecture Webcasts**

- "Pandeia: The JWST Exposure Time Calculator" - Klaus Pontoppidan (17 Jan 2017)

- <https://webcast.stsci.edu/webcast/detail.xhtml?talkid=5387>

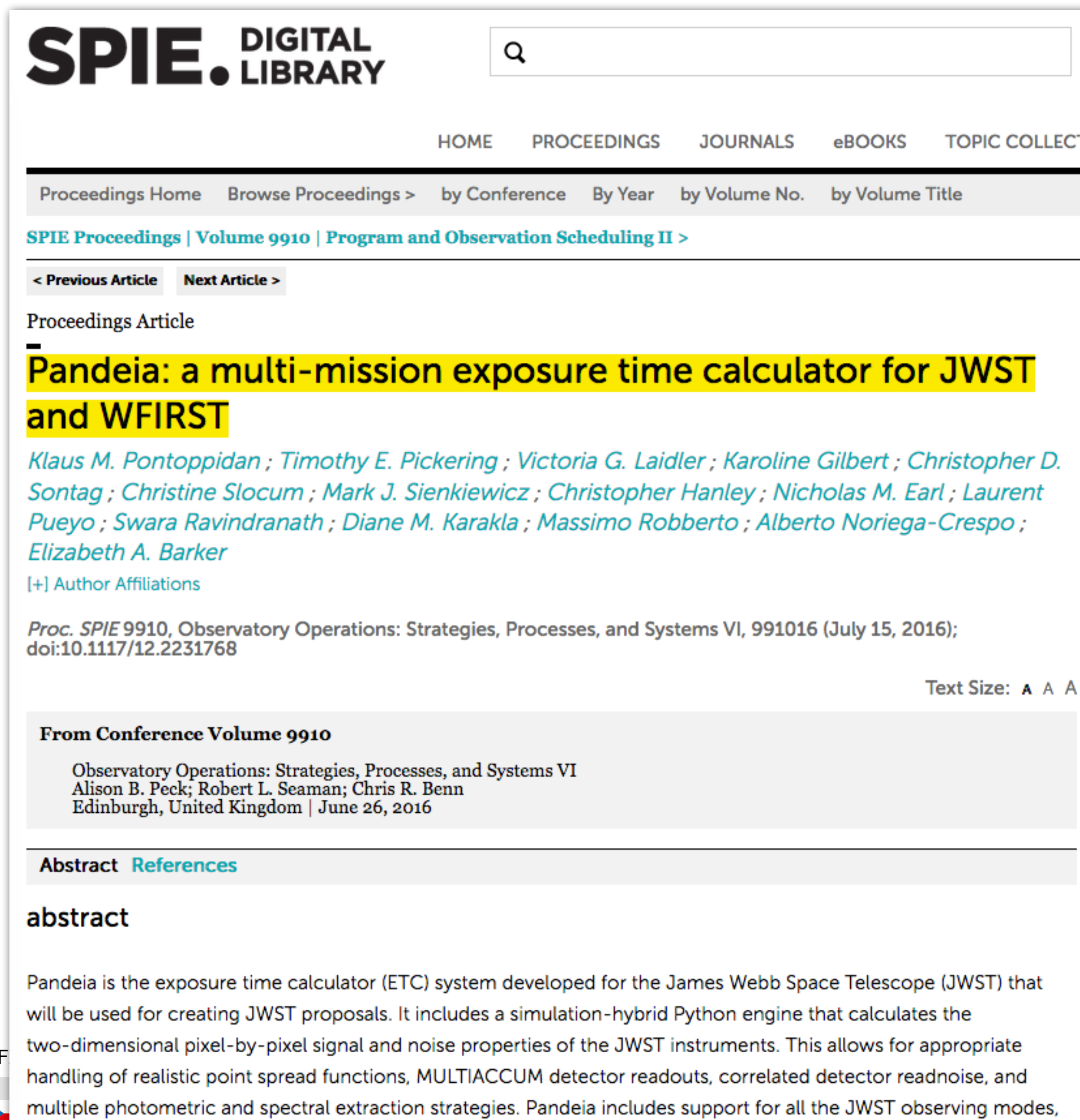
- "JWST ETC Demo" (interface demonstration) - Swara Ravindranath (21 Feb 2017)

- <https://webcast.stsci.edu/webcast/detail.xhtml?talkid=5418>



ST&I





SPIE. DIGITAL LIBRARY

HOME PROCEEDINGS JOURNALS eBooks TOPIC COLLECTIONS

Proceedings Home Browse Proceedings > by Conference By Year by Volume No. by Volume Title

SPIE Proceedings | Volume 9910 | Program and Observation Scheduling II >

< Previous Article Next Article >

Proceedings Article

Pandeia: a multi-mission exposure time calculator for JWST and WFIRST

Klaus M. Pontoppidan ; Timothy E. Pickering ; Victoria G. Laidler ; Karoline Gilbert ; Christopher D. Sontag ; Christine Slocum ; Mark J. Sienkiewicz ; Christopher Hanley ; Nicholas M. Earl ; Laurent Pueyo ; Swara Ravindranath ; Diane M. Karakla ; Massimo Robberto ; Alberto Noriega-Crespo ; Elizabeth A. Barker

[+] Author Affiliations

Proc. SPIE 9910, Observatory Operations: Strategies, Processes, and Systems VI, 991016 (July 15, 2016); doi:10.1117/12.2231768

Text Size: A A A

From Conference Volume 9910

Observatory Operations: Strategies, Processes, and Systems VI
Alison B. Peck; Robert L. Seaman; Chris R. Benn
Edinburgh, United Kingdom | June 26, 2016

Abstract [References](#)

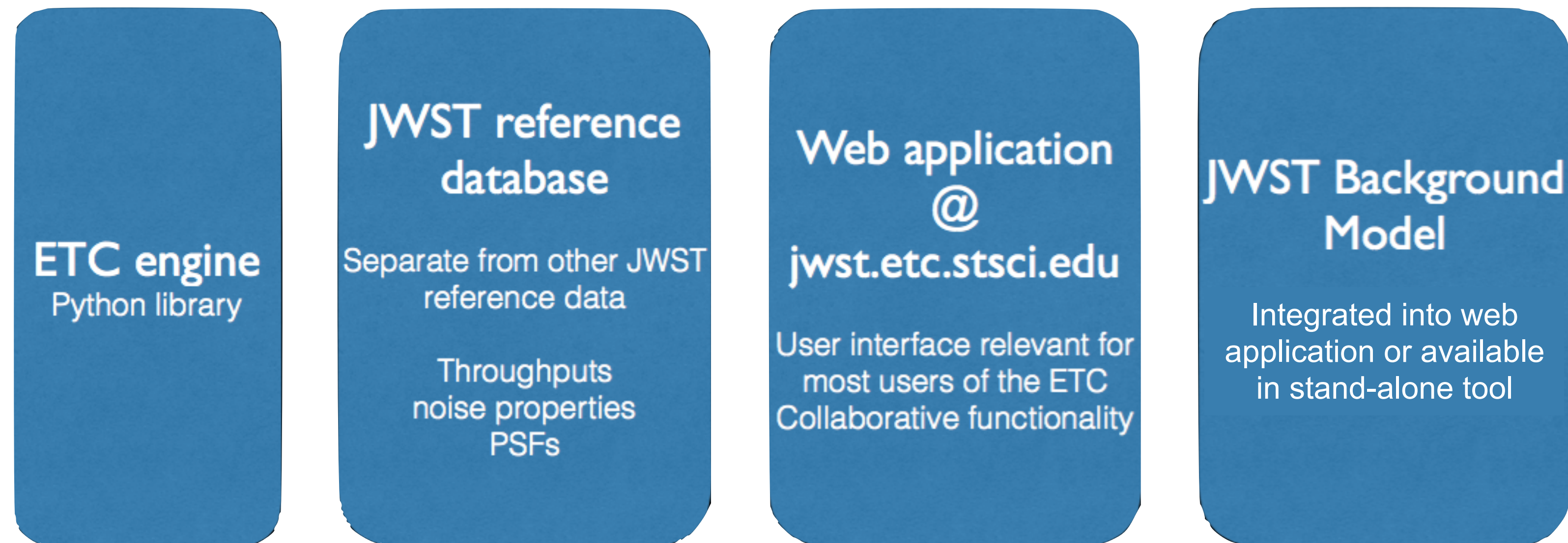
abstract

Pandeia is the exposure time calculator (ETC) system developed for the James Webb Space Telescope (JWST) that will be used for creating JWST proposals. It includes a simulation-hybrid Python engine that calculates the two-dimensional pixel-by-pixel signal and noise properties of the JWST instruments. This allows for appropriate handling of realistic point spread functions, MULTIACCUM detector readouts, correlated detector readnoise, and multiple photometric and spectral extraction strategies. Pandeia includes support for all the JWST observing modes,

Pontoppidan et al., Proc. SPIE. 9910, Observatory Operations: Strategies, Processes, and Systems VI, 991016. July 15, 2016

doi: 10.1117/12.2231768

Available on arXiv:
<https://arxiv.org/abs/1707.02202>



- ETC engine (v1.2) available for download

- <https://jwst.stsci.edu/science-planning/proposal-planning-toolbox/exposure-time-calculator-etc>
- More functionality than web application, but no direct access to the JWST background model

- JWST background tool

- <https://jwst-docs.stsci.edu/display/JPP/JWST+Backgrounds+Tool>

- Web application recommended for most users

- <https://jwst.etc.stsci.edu/>

An aside... JWST background model

- **Zodiacal + ISM (Galactic)**

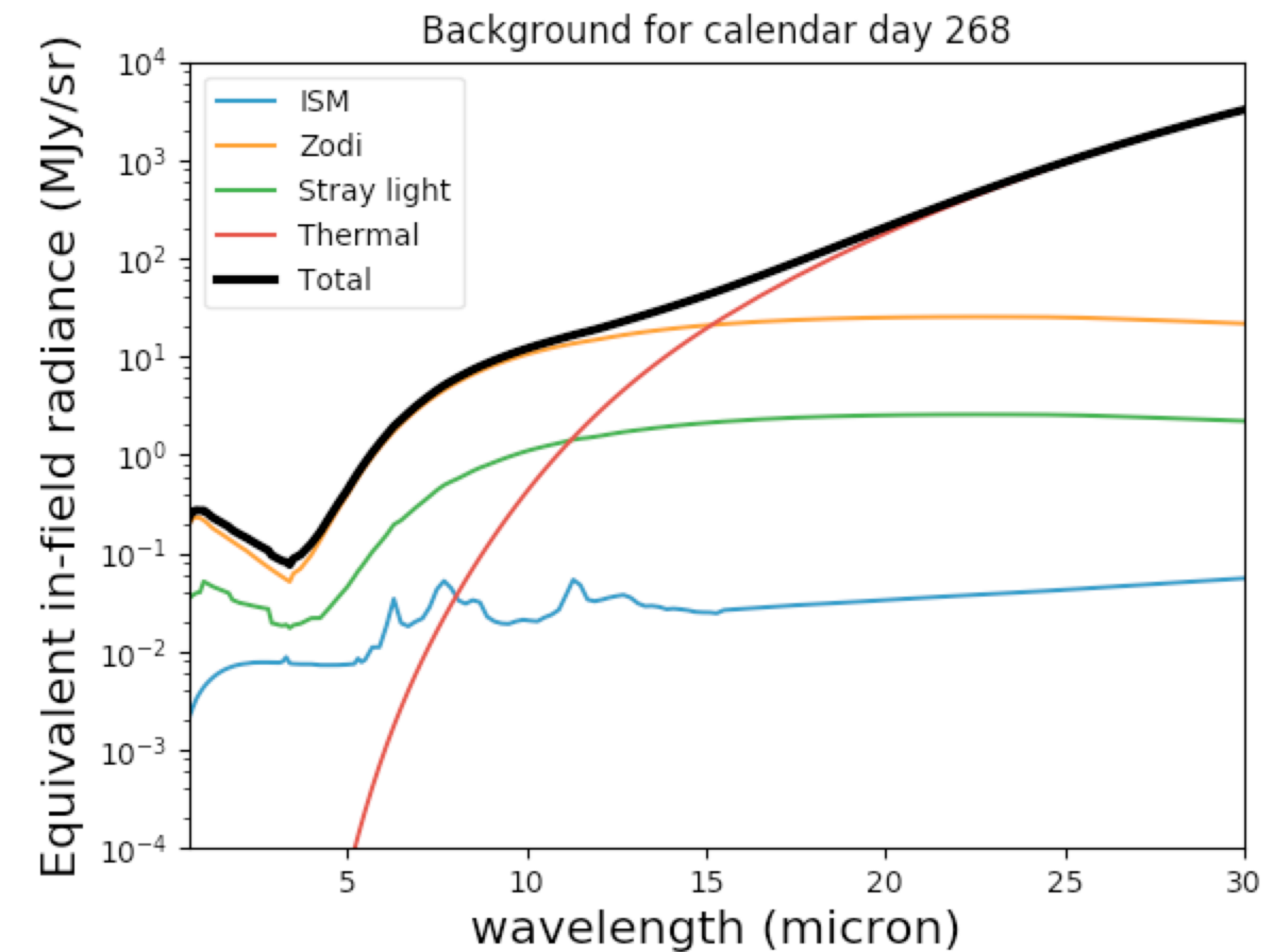
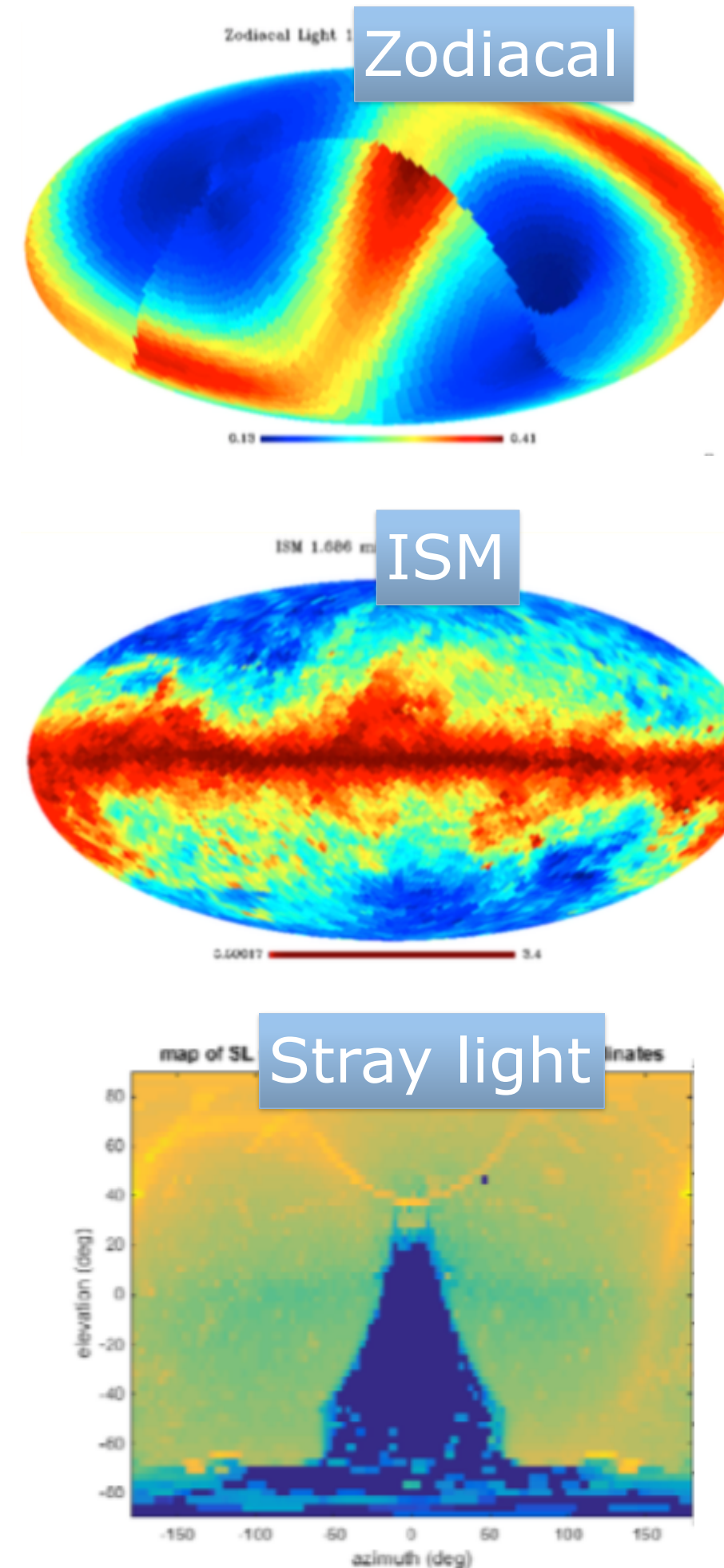
- Model heritage from Spitzer
- Data from COBE/DIRBE

- **Stray light**

- Radiance Transfer Functions from Lightsey 2016 (SPIE)

- **Thermal self-emission**

- Dominant background at $>15\mu\text{m}$
- Sum of 20 blackbodies



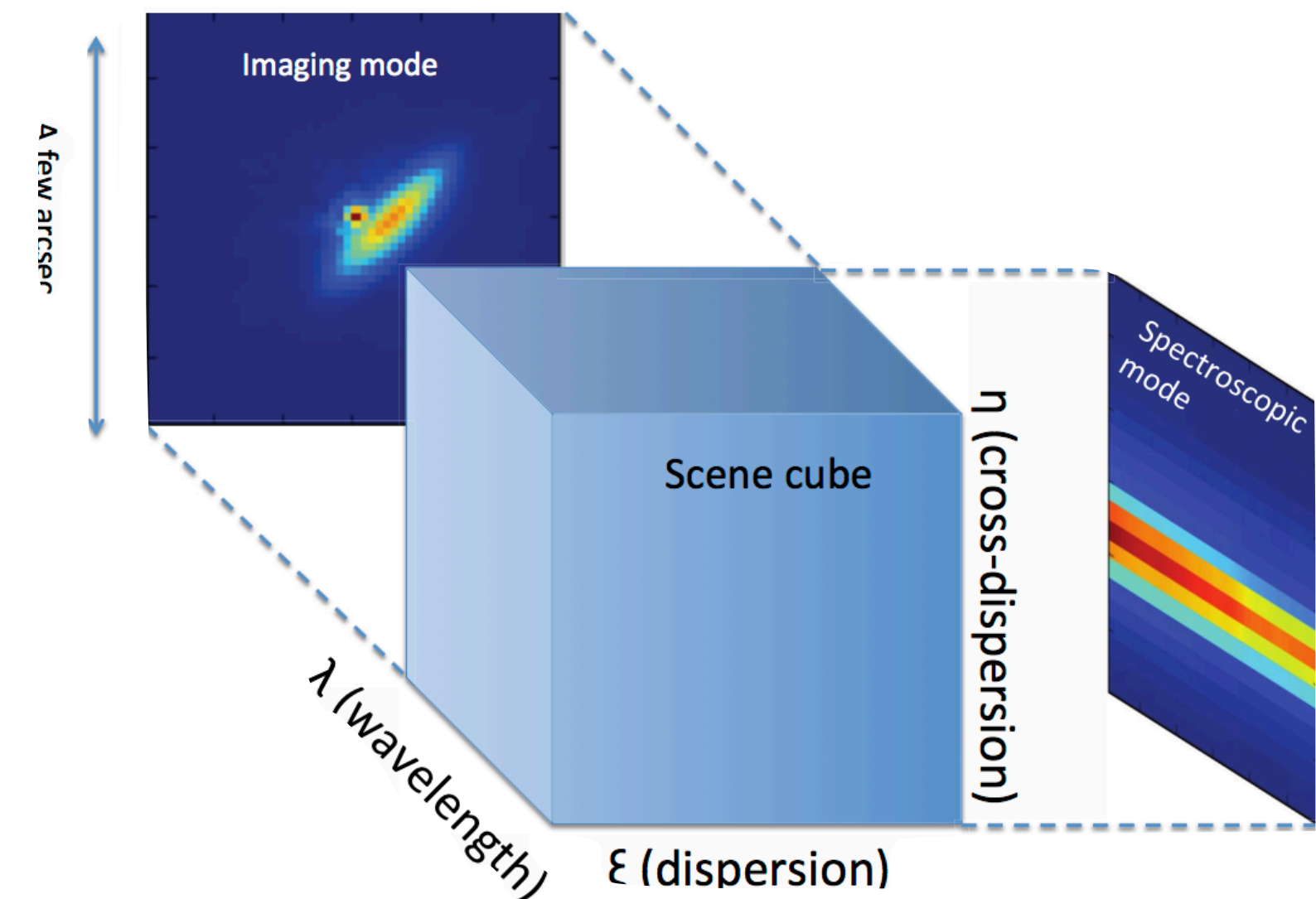
- <https://jwst-docs.stsci.edu/display/JPP/JWST+Background+Model>

- Modern design

- Signal (source + background) modelled in 3D
- Pixel based:
 - Models the detector (e.g. correlated noise)
 - Final s/n calculation can include data analysis and post-processing steps
 - Allows the modelling of complex scenes (e.g. estimate contamination from bright sources)

- Supports all JWST modes

- Imaging
- Spectroscopy: single slit, slitless, MOS and IFU
- Coronagraphy
- Aperture Masking Interferometry (AMI)
- Target acquisition modes (all instruments)



- **Workbooks**

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

- **Reusable scenes and sources**

- Small postage-stamps of the sky (a few arcsec on a side)
- A scene can have no source (just background) or multiple sources
- Sources and scenes can be defined once and used in many calculations

- **Copy and modify workflow**

- Do not have to start from scratch
- Calculations in a workbook start with reasonable defaults
- Simply copy a calculation, modify the inputs as desired and recalculate

- **Auto-update**

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

- **ETC calculates S/N**
 - S/N based on source parameters, instrument configuration and detector set-up
 - Exposure time is an intermediate product
- **Upload spectrum**
 - Upload your own spectrum files
- **Batch expansion**
 - Efficiently run a batch of many calculations
 - Calculation is duplicated N times varying only the selected parameter
 - Expansion over time parameters (Ngroups etc) offers a way to show the behaviour of SNR as a function of “exposure” time
- **Encourage collaborative work**
 - Workbook sharing is enabled and strongly encouraged
 - Select a workbook from the list page and assign user access permissions
 - Shared workbooks will appear on the workbook list of collaborators

Welcome to the JWST Exposure Time Calculator

Create User

Login

Work Anonymously

...to start

Help Desk &
User Guide

News

Welcome to version 1.2 of the JWST ETC!

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

When you log in to the 1.2 ETC, your old workbooks will be marked "Out of Date":

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

Be sure to review the [Known Issues](#) with this release.

Known Issues

Readme

- Log in with MyST, or work anonymously

- The JWST ETC allows you to have multiple **workbooks**. Each workbook allows you to define **sources**, place them in **scenes**, and use the scenes in **calculations**. Sources may be used in multiple scenes, and scenes may be used by multiple calculations, which will be automatically recalculated to reflect any changes made. Reasonable default values are provided for all fields.

- Workbooks for logged-in users are automatically saved and will be available in your workbook list upon return. If you are working anonymously, you can log in with MyST at any time, and your workbooks will be transferred to your user account.

- For ETC Documentation, see [Help->User Guide](#). For help or to provide feedback, contact the JWST Help Desk ([Help->Help Desk](#)).

- We recommend the use of Firefox, or Chrome. Safari has been observed to occasionally cause problems.

- Be sure to read the [Known Issues](#) page for **important information about system accuracy, limitations, and workarounds**.

System Performance

Calculation run times for certain instrument modes (SOSS; NIRSpec IFU; coronagraphy) are longer because the underlying computations are more complex.

The use of highly sampled spectra, or sources with extremely narrow lines, may result in significantly longer run times for spectroscopic modes.

Occasionally the UI may appear to be unresponsive or stalled. Try reloading the page; this often clears the issue.

System performance depends on usage/load; if the system appears unresponsive, wait 1-2 minutes. Please avoid repeatedly clicking, because this will make the problem worse. If the system remains unresponsive, contact the [JWST Help Desk](#).

Accuracy of ETC Calculations

This version of the ETC is intended to help users to propose and plan observations for the Director's Discretionary Early Release Science Program (DD-ERS) and for the Cycle 1 Guaranteed Time (GTO) and General Observer (GO) programs. The ETC approximates our current best knowledge and understanding of the performance of the JWST instruments, based on ground measurements and calibrations. It has been validated against independent instrument models provided by the instrument teams. It is important to note that there are remaining uncertainties associated with system throughputs, detector noise properties, etc., which will not decrease until the observatory is in orbit. Users should exercise appropriate caution when interpreting results from the ETC. A number of known issues remain, which may affect predicted sensitivities. See [Known Issues](#) for additional details.

The ETC is not intended to be a complete observation simulator, and some higher-order effects are not taken into account, such as field distortion.

User Guide

Exposure Time Calculator anon_6000 ▾ Help ▾

Available Workbooks

# ▾	Name -	Out of Date	Load	Description -	Options
14360	Slitted Spec (including MSA)		[Load]	Sample of slitted spectroscopy calculations of point sources, including NIRSpec fixed slit and MSA and MIRI LRS observations.	[copy][remove]
14361	Sample Coronagraphy Calculations		[Load]	MIRI and NIRCам coronagraphy calculations using three faint sources, one central star, and one reference source	[copy][remove]
14362	Slitless & IFU calculations		[Load]	Slitless and IFU calculations performed on scenes with multiple extended sources	[copy][remove]

Workbooks are "persistent" - they will still be there next time you login (except for anonymous users)

Create New WorkbookGet a Copy of a Sample Workbook ▾

Explore example workbooks

User Access Permissions for Slitted Spec (including MSA)

Add User by Email

User ▾	Read	Write	Grant	Revoke
anon_6000	☑	☑	☑	☑

3-step workflow

1. Create one or more sources

- Default source is a point source with a flat continuum spectrum
- For each source, you may specify SED, normalisation, extinction, emission lines and shape

2. Create one or more scenes

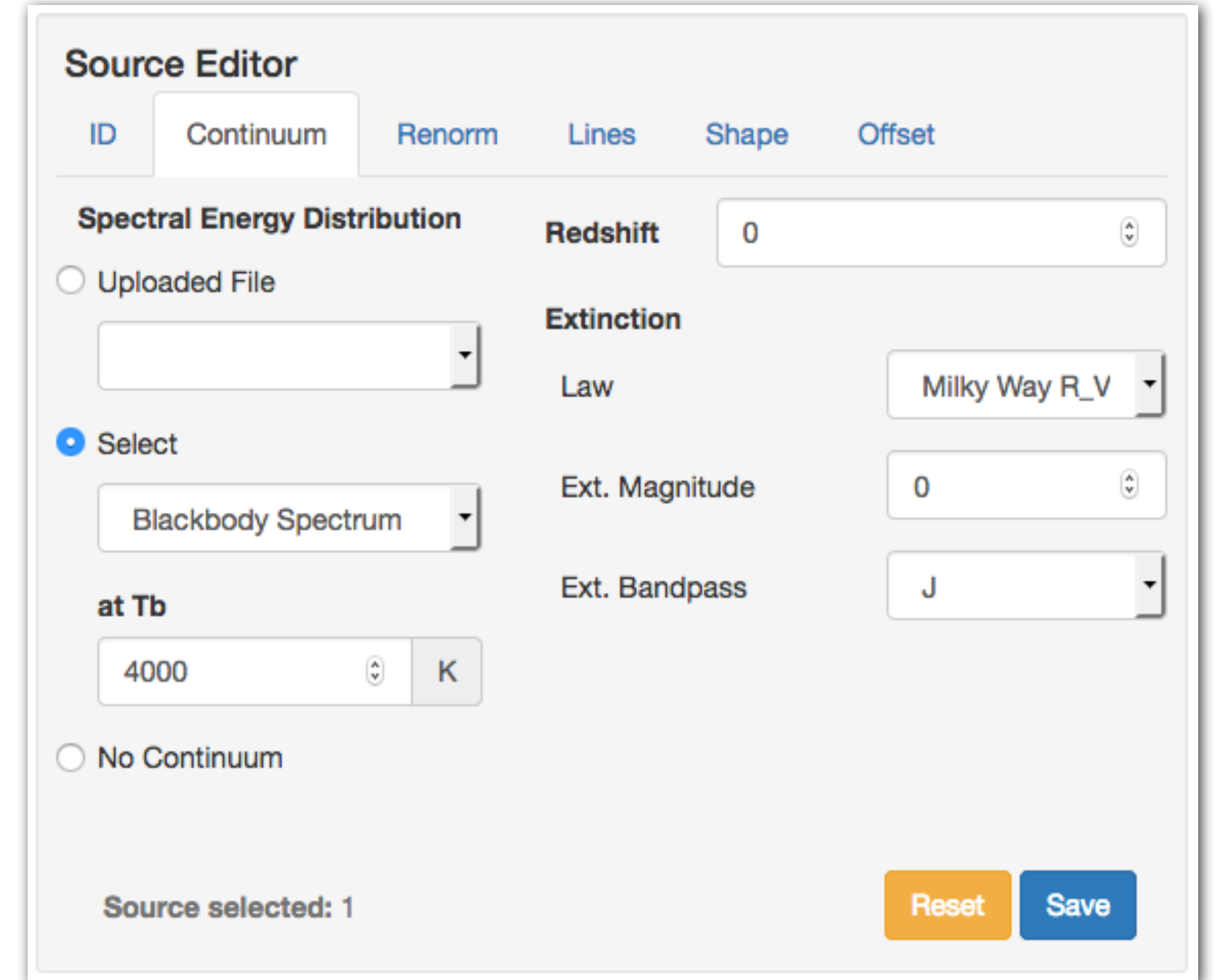
- Scenes are specific collections of one or more sources (or zero sources for background)
- For each source, specify its location (offset from the centre) and orientation (for extended sources)

3. Create calculations

- For each calculation, specify:
 - the scene
 - the background
 - instrument configuration and exposure parameters
 - extraction strategy parameters

Scenes and sources

- Scenes contain multiple sources
- Sources can be included in multiple scenes
- Source can be located anywhere within the postage stamp scene
- **How to specify your source:**
 - Continuum: flat, black body, power law, templates
 - Lines: user-specified
 - Normalise to magnitude/flux in JWST or HST bandpass, or at a λ
 - Upload a spectrum: ASCII or FITS format
(<https://jwst-docs.stsci.edu/display/JPP/JWST+ETC+User+Supplied+Spectra>)
 - For extended sources: flat, Sersic, 2D Gaussian profile



The screenshot shows the 'Source Editor' interface with several tabs: ID, Continuum (selected), Renorm, Lines, Shape, and Offset. Under 'Spectral Energy Distribution', the 'Select' radio button is chosen, and 'Blackbody Spectrum' is selected in the dropdown. The 'at Tb' field is set to 4000 K. On the right, 'Redshift' is 0, 'Extinction Law' is 'Milky Way R_V', 'Ext. Magnitude' is 0, and 'Ext. Bandpass' is 'J'. At the bottom, it says 'Source selected: 1' and has 'Reset' and 'Save' buttons.

Scenes and sources page

Scenes and sources page tab

Exposure Time Calculator Edit Expand anon_6000 Help

Slitted Spec (including MSA) Sample of slitted spectroscopy calculations of point sources, including NIRSpec fixed slit and MSA and MIRI LRS observations.

Calculation **Scenes and Sources** Upload Spectra Caveats and Limitations

Select a Scene

★ Default Scene

ID	Name	Sources	# Calcs
☆ 1	single_source	1	5
★ 2	double_source	1,2	2

New Add Source Remove Source Delete

Select a Source

ID	Plot Name	Scenes	# Calcs
1	Star 1	1,2	7
2	Star 2	2	2

New Delete

Source Editor

ID Continuum Renorm Lines Shape Offset

Normalize Source Flux Density
Renormalization applied after redshift

Normalize at wavelength
0.2 mJy
lambda 2 μm

Normalize in bandpass
0.00001 flam

JWST MIRI/IMAGING F560W
 HST WFC3/IR F098M

Source selected: 2 Reset Save

Configuration pane

Scenes table

Sources table with checkbox to select for plotting (checkbox colour matches line in plot)

Scene Sketch

2: double_source

arcsec

Source Spectrum Plots

Source Spectrum

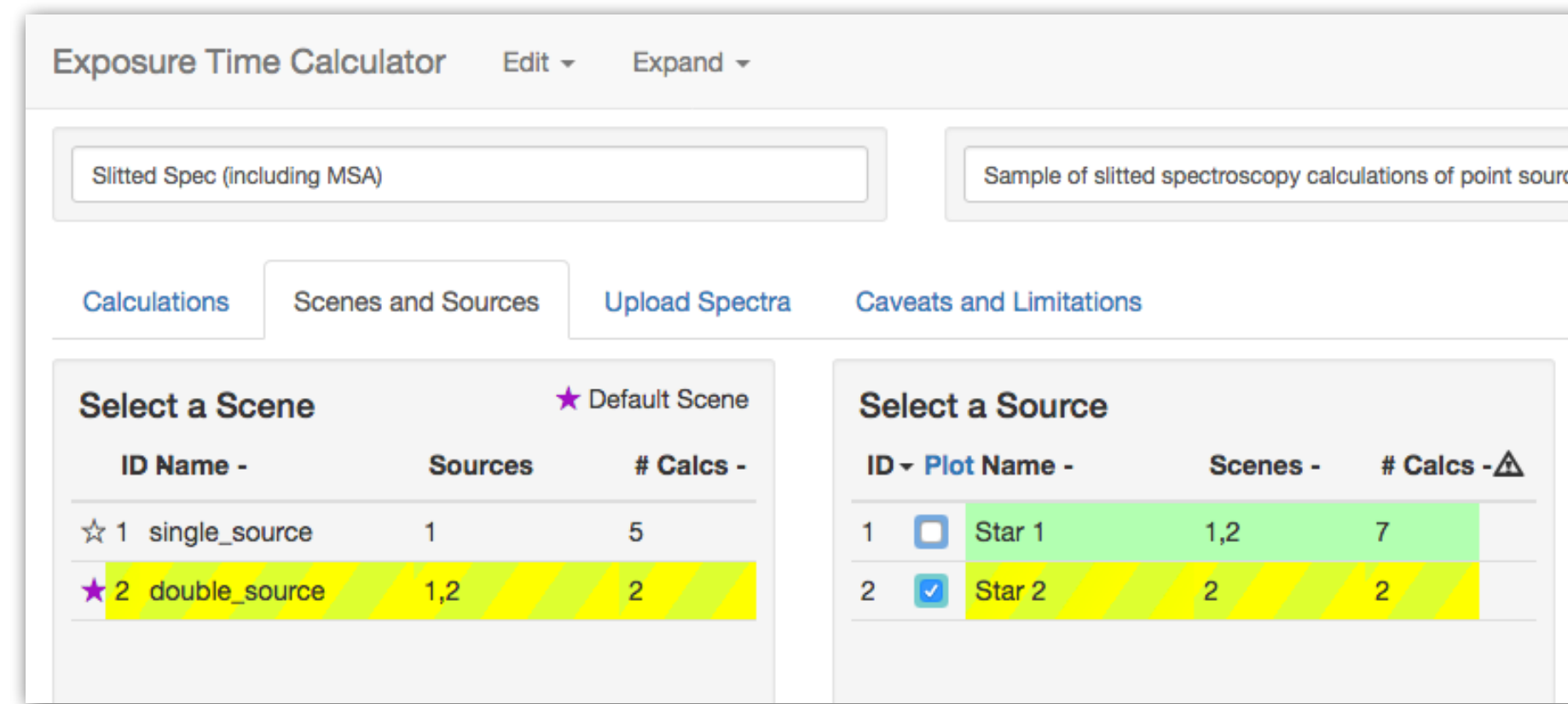
mJy microns

Scene and spectrum input plots

Affected calculations

ID	Name	Scene
1	nirspec_msa	1
4	nirspec_msa	1
6	nirspec_msa	2
7	nirspec_msa	2
8	nirspec_fixed_slit	1
9	miri_lrslit	1
10	nirspec_fixed_slit	1

Scenes and sources page

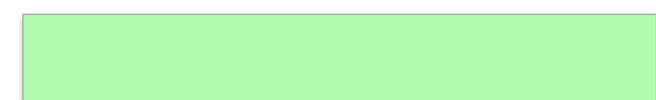


Default scene will be used by any new calculations

- Scene table and source table are interlinked



Selected item, currently active and modifiable



Item affected by selection made in another table

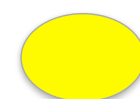


Item can be both selected and affected

- Scene sketch is linked to the scene and source lists

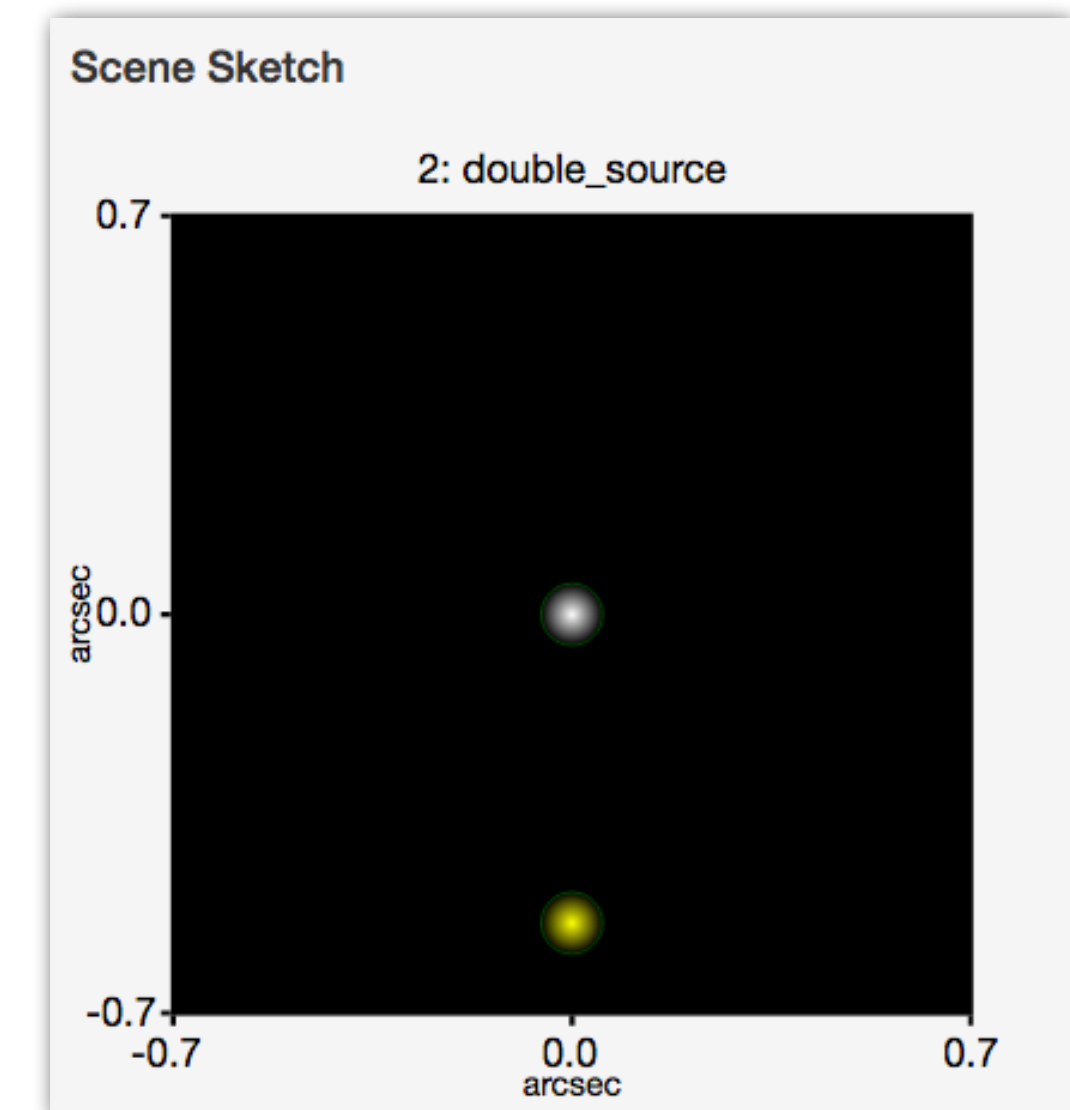


Selected scene is displayed in the sketch



Selected source is displayed in yellow

(Clicking on a source in the sketch selects it in the list)



Calculations page (upper half = input)

Calculations page tab

Exposure Time Calculator Edit Expand anon_6000 Help

Slitted Spec (including MSA) Sample of slitted spectroscopy calculations of point sources, including NIRSpec fixed slit and MSA and MIRI LRS observations.

Calculations Scenes and Sources Upload Spectra Caveats and Limitations

MIRI NIRCam NIRISS NIRSpec

ID	Mode	Scene	(s)	SNR	
10	nirspec fixed_slit	1	191.63	75.13	✓
9	miri lrsslit	1	277.50	0.45	✓
8	nirspec fixed_slit	1	191.63	10.48	✓
7	nirspec msa	2	440.21	45.08	✓
6	nirspec msa	2	440.21	0.42	✓
4	nirspec msa	1	440.21	44.15	✓
1	nirspec msa	1	440.21	47.52	✓
-	-	-	-	-	-

Configuration pane
Scene tab
(Renorm sub-tab)

Scene Backgrounds Instrument Setup Detector Setup Strategy

Scene for Calculation: 1: single_source
★ Default scene is 2.

Sources in that Scene: 1: Star 1

Normalize Source Flux Density
Renormalization applied after redshift

Normalize at wavelength
0.1 mJy
lambda 2 μm

Normalize in bandpass
0.00001 flam

JWST MIRI/IMAGING F560W
 HST WFC3/IR F098M

Calculation selected: 8, Mode: nirspec fixed_slit Reset Calculate

Calculations table

Calculations page (upper half = input)

Calculations page tab

Exposure Time Calculator Edit Expand anon_6000 Help

Slitted Spec (including MSA) Sample of slitted spectroscopy calculations of point sources, including NIRSpec fixed slit and MSA and MIRI LRS observations.

Calculations Scenes and Sources Upload Spectra Caveats and Limitations

MIRI NIRCam NIRISS NIRSpec

ID	Mode	Scene	(s)	SNR	
10	nirspec fixed_slit	1	191.63	75.13	✓
9	miri lrsslit	1	277.50	0.45	✓
8	nirspec fixed_slit	1	191.63	10.48	✓
7	nirspec msa	2	440.21	45.08	✓
6	nirspec msa	2	440.21	0.42	✓
4	nirspec msa	1	440.21	44.15	✓
1	nirspec msa	1	440.21	47.52	✓
-	-	-	-	-	-

Scene ★ **Backgrounds** Instrument Setup Detector Setup Strategy Backgrounds tab

Position
Ra Dec 0:00:00.00 0:00:00.00

Background configuration
 None Low Medium High

Date Jul 1 2020

Calculation selected: 8, Mode: nirspec fixed_slit Reset Calculate

Calculations table

Calculations page (upper half = input)

Calculations page tab

Exposure Time Calculator Edit Expand anon_6000 Help

Slitted Spec (including MSA) Sample of slitted spectroscopy calculations of point sources, including NIRSpec fixed slit and MSA and MIRI LRS observations.

Calculations Scenes and Sources Upload Spectra Caveats and Limitations

MIRI NIRCam NIRISS **NIRSpec**

ID	Mode	Scene	(s)	SNR	
10	nirspec fixed_slit	1	191.63	75.13	✓
9	miri lrsslit	1	277.50	0.45	✓
8	nirspec fixed_slit	1	191.63	10.48	✓
7	nirspec msa	2	440.21	45.08	✓
6	nirspec msa	2	440.21	0.42	✓
4	nirspec msa	1	440.21	44.15	✓
1	nirspec msa	1	440.21	47.52	✓

Scene Backgrounds **Instrument Setup** Detector Setup Strategy

NIRSpec Fixed Slit

Grating/Filter Pair: G235H/F170LP

Slit: S200 A1 (0.2" x 3.3")

Wavelength range: (1.66 - 3.17)

Calculation selected: 8, Mode: nirspec fixed_slit

Reset Calculate

Configuration pane
Instrument Setup tab

Calculations table

Calculations page (upper half = input)

Calculations page tab

Exposure Time Calculator Edit Expand anon_6000 Help

Slitted Spec (including MSA) Sample of slitted spectroscopy calculations of point sources, including NIRSpec fixed slit and MSA and MIRI LRS observations.

Calculations Scenes and Sources Upload Spectra Caveats and Limitations

MIRI NIRCam NIRISS NIRSpec

ID	Mode	Scene	(s)	SNR	
10	nirspec fixed_slit	1	191.63	75.13	✓
9	miri lrsslit	1	277.50	0.45	✓
8	nirspec fixed_slit	1	191.63	10.48	✓
7	nirspec msa	2	440.21	45.08	✓
6	nirspec msa	2	440.21	0.42	✓
4	nirspec msa	1	440.21	44.15	✓
1	nirspec msa	1	440.21	47.52	✓
-	-	-	-	-	-

Scene Backgrounds Instrument Setup **Detector Setup** Strategy

Subarray: S200 A1 Readout pattern: NRS

Groups per integration: 10 Integrations per exposure: 3 Exposures per specification: 1

Total exposure time: 00:03:12 (191.63 s)

Total integrations: 3

Calculation selected: 8, Mode: nirspec fixed_slit Reset Calculate

Configuration pane
Detector Setup tab

Calculations table

Calculations page (upper half = input)

Calculations page tab

Exposure Time Calculator Edit Expand anon_6000 Help

Slitted Spec (including MSA) Sample of slitted spectroscopy calculations of point sources, including NIRSpec fixed slit and MSA and MIRI LRS observations.

Calculations Scenes and Sources Upload Spectra Caveats and Limitations

MIRI NIRCam NIRISS NIRSpec

ID	Mode	Scene	(s)	SNR	
10	nirspec fixed_slit	1	191.63	75.13	✓
9	miri lrsslit	1	277.50	0.45	✓
8	nirspec fixed_slit	1	191.63	10.48	✓
7	nirspec msa	2	440.21	45.08	✓
6	nirspec msa	2	440.21	0.42	✓
4	nirspec msa	1	440.21	44.15	✓
1	nirspec msa	1	440.21	47.52	✓
-	-	-	-	-	-

Scene Backgrounds Instrument Setup Detector Setup **Strategy**

Aperture Spectral Extraction

Aperture location

Centered on source

1: Star 1

X, Y: 0,0 arcsec (unused)

Specify offsets in scene

Y 0 arcsec

Wavelength of Interest (1.66 - 3.17)

2 microns

Aperture Half-Height 0.15 arcsec

Perform Background Subtraction Using

background region

noiseless sky background

Sky sample region

Start region 0.3 arcsec

End region 0.5 arcsec

Angular units arcsec

Calculation selected: 8, Mode: nirspec fixed_slit

Reset Calculate

Configuration pane Strategy tab

Calculations table

Calculations page (lower half = results)

NOTE:

Scenes are reusable.

Changes to any sources, scenes or configurations will be propagated through all affected calculations.

Errors and warnings are indicated in the calculations tables.

Critical error



Warning



No problems



9	<input type="checkbox"/>	miri lrslit	1	277.50	0.45	<input checked="" type="checkbox"/>
8	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	191.63	10.48	<input checked="" type="checkbox"/>
7	<input type="checkbox"/>	nirspec msa	2	311.37	36.15	<input checked="" type="checkbox"/>
6	<input type="checkbox"/>	nirspec msa	2	440.21	0.42	<input checked="" type="checkbox"/>
4	<input type="checkbox"/>	nirspec msa	1	440.21	44.15	<input checked="" type="checkbox"/>
1	<input type="checkbox"/>	nirspec msa	1	440.21	47.52	<input checked="" type="checkbox"/>

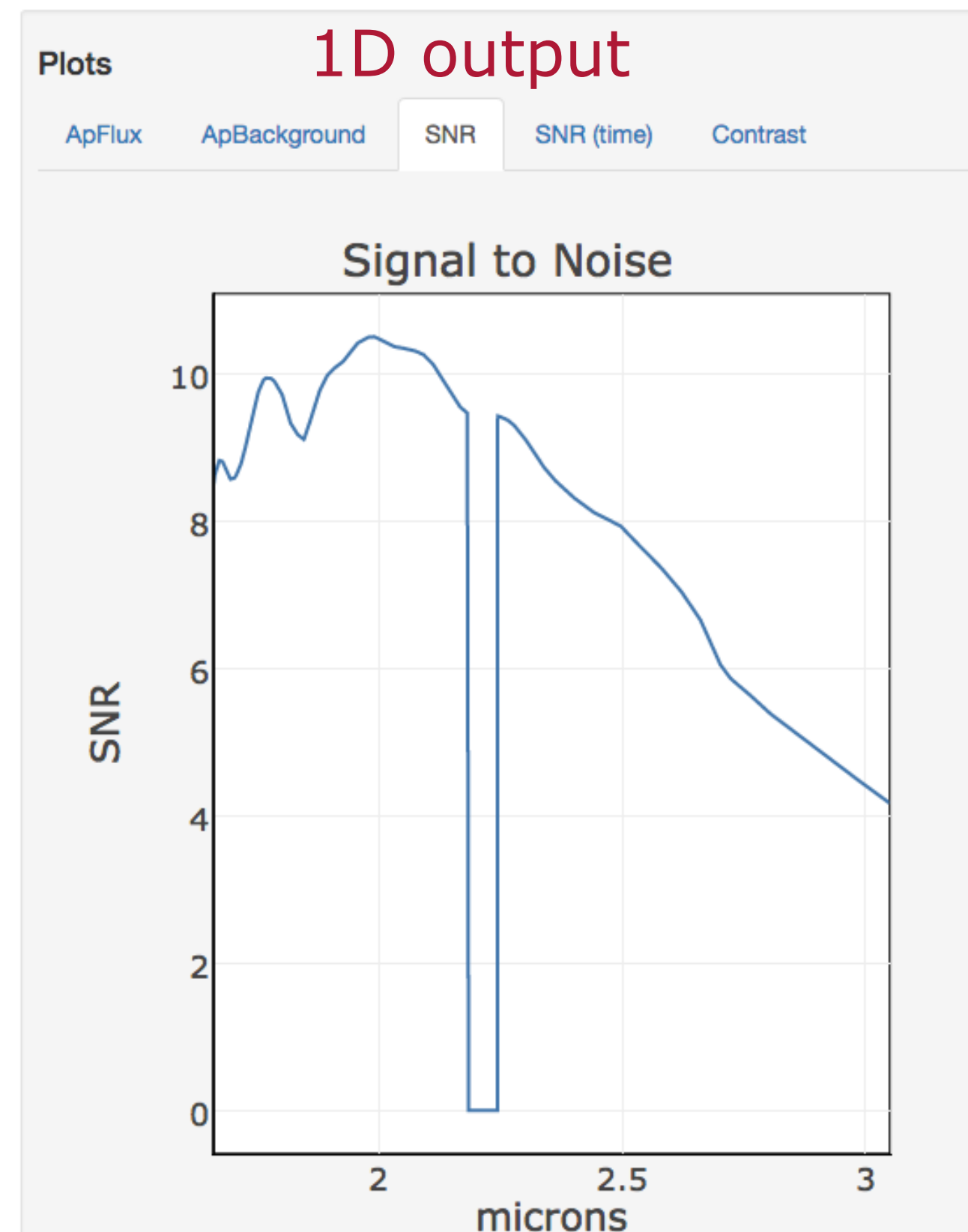
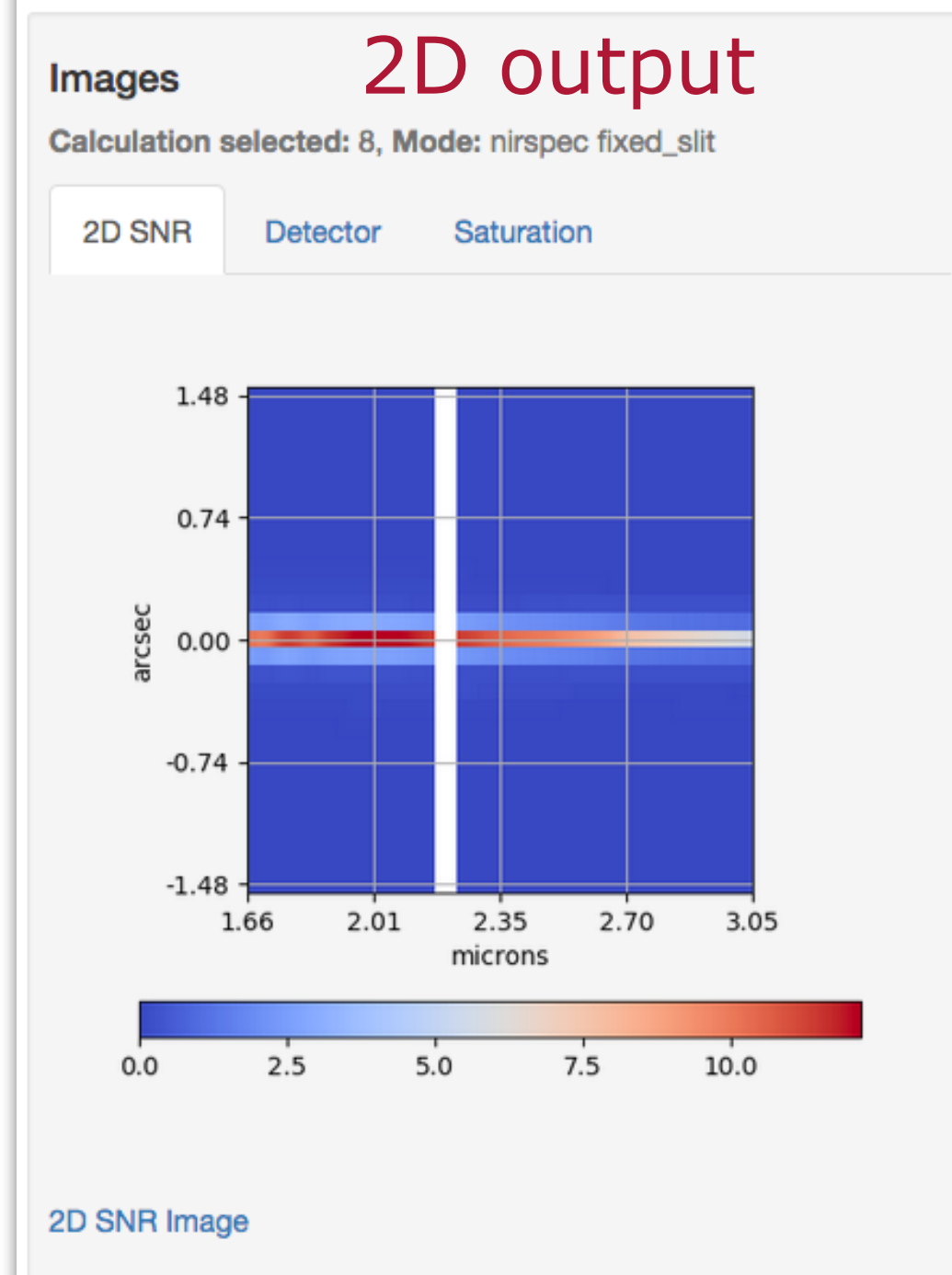
Calculations table

Centered on source 0.15 arcsec
 Specify offsets in scene
 X, Y: 0,0 arcsec (unused)
 Y: 0 arcsec
 Wavelength of Interest: 2 microns (1.66 - 3.17)
 Angular units: arcsec

Perform Background Subtraction Using
 background region
 noiseless sky background

Sky sample region
 Start region: 0.3 arcsec
 End region: 0.5 arcsec

Calculation selected: 8, Mode: nirspec fixed_slit
Reset Calculate



Reports

Calculation selected: 8, Mode: nirspec fixed_slit

Report Warnings Errors

Downloads

Instrument Filter/Disperser:	f170lp/g235h
Extraction Aperture Position (arcsec):	[0.00, 0.00]
Wavelength of Interest used to Calculate Scalar Values (microns):	2.00
Size of Extraction Aperture (arcsec):	0.15
Total Time Required for Strategy (seconds):	191.63
Total Exposure Time (seconds):	191.63
Extracted Flux (e-/sec):	2.14
Standard Deviation in Extracted Flux (e-/sec):	0.20
Extracted Signal-to-Noise ratio:	10.48
Input Background Surface Brightness (MJy/sr):	0.28
Total Background Flux in	0.04

Reports			
Calculation selected: 6, Mode: nircam wfgrism			
Report	Warnings	Errors	Downloads
Instrument Filter/Dispenser:	f356w/grismr		
Extraction Aperture Position (arcsec):	[0.70, -0.50]		
Wavelength of Interest used to Calculate Scalar Values (microns):	3.62		
Size of Extraction Aperture (arcsec):	0.15		
Total Time Required for Observation (seconds):	1965.42		
Total Exposure Time (seconds):	1965.42		
Extracted Flux (e-/sec):	1.5e-3		
Variance in Extracted Flux (e-/sec):	0.05		
Extracted Signal-to-Noise ratio:	0.03		
Input Background Surface Brightness (MJy/sr):	0.13		
Total Background Flux in Extraction Aperture (e-/sec):	1.98		
Total Sky Background Flux in Extraction Aperture (e-/sec):	1.97		
Fraction of Total Background due to Signal From Scene:	2.7e-3		
Average Number of Cosmic Rays per Ramp:	0.16		

Numerical results are at the λ specified in the Strategy tab

- **Report**
 - Calculated scalar values
 - Summary of inputs
- **Warnings**
 - Information affecting accuracy, or otherwise influencing science decisions
- **Errors**
 - Information about why the calculation did not complete
- **Downloads**
 - .tar file of the engine input, intermediate products and output data
 - FITS files of 3D data cube for IFU
 - 2D images and spectra
 - extracted flux, combined backgrounds, SNR as FITS table
 - <https://jwst-docs.stsci.edu/display/JPP/JWST+ETC+Downloads>

Exploring the parameter space

Exposure Time Calculator

Expand

- Expand Groups...
- Expand Integrations...
- Expand Filters

Calculations | Scenes and Sources | Upload Spectra | Caveats and Limitations

ID	Mode	Scene	(s)	SNR	
15	nirspec fixed_slit	1	266.42	15.06	✓
14	nirspec fixed_slit	1	247.72	13.98	✓
13	nirspec fixed_slit	1	229.03	12.85	✓
12	nirspec fixed_slit	1	210.33	11.68	✓
11	nirspec fixed_slit	1	191.63	10.48	✓
10	nirspec fixed_slit	1	191.63	75.13	✓
9	miri lrslit	1	277.50	0.45	✓
8	nirspec fixed_slit	1	191.63	10.48	✓
7	nirspec msa	2	311.37	36.15	✓
6	nirspec msa	2	440.21	0.42	✓
4	nirspec msa	1	440.21	44.15	✓
1	nirspec msa	1	440.21	47.52	✓

new calculations with varying "Ngroups"

Scene ★ | Backgrounds | Instrument Setup | Detector Setup | Strategy

Subarray: S200 A1 | Readout pattern: NRS

Groups per integration: 10 | Integrations per exposure: 3 | Exposures per specification: 1

Total exposure time: 00:03:12 (191.63 s)

Total integrations: 3

Calculation selected: 8, Mode: nirspec fixed_slit

Reset | Calculate

Batch Groups Configuration

Note: All values must be integers.

Start Value: 10 (Must be greater than 2)

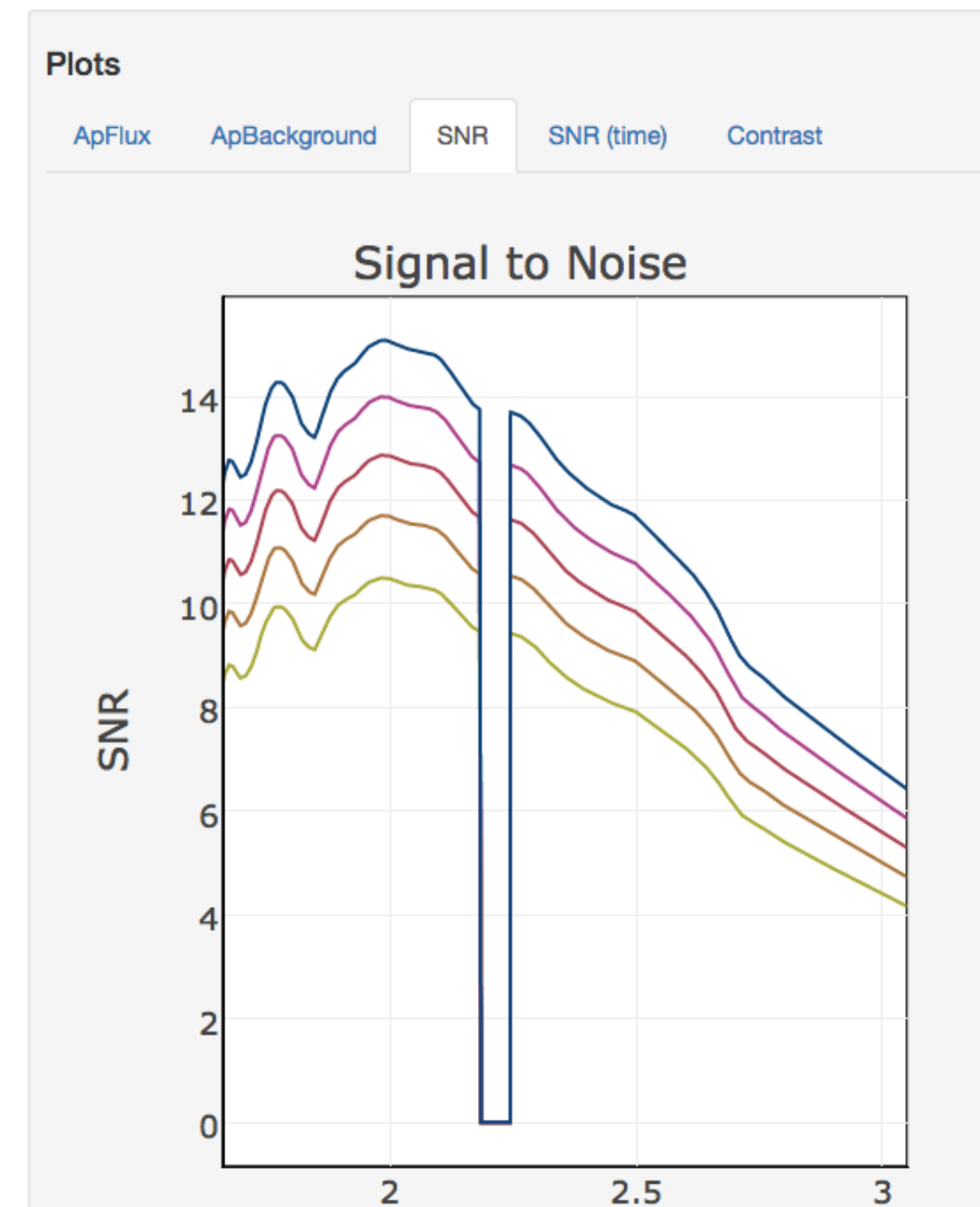
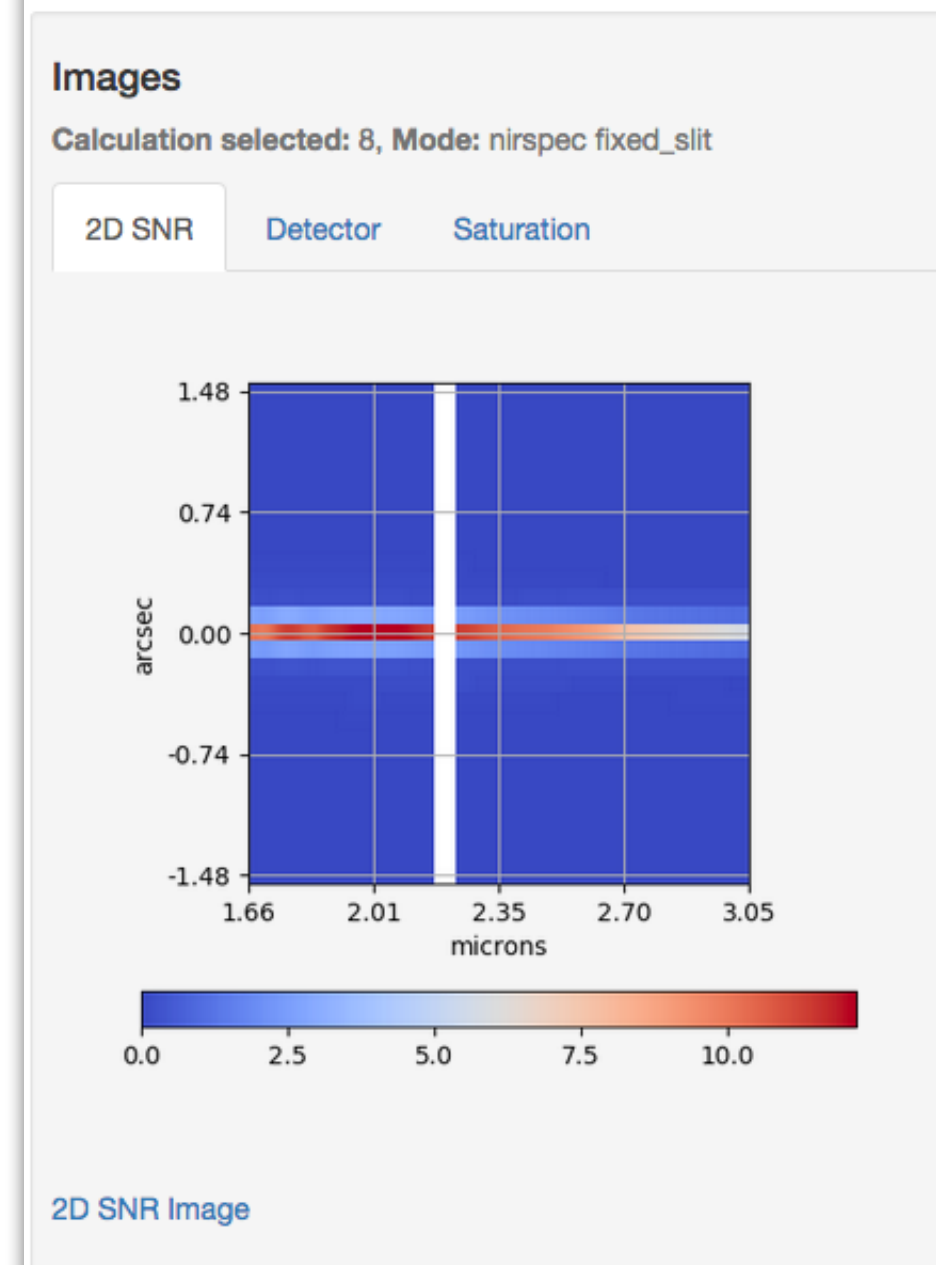
Step Size: 1

Iterations: 5 (Must be less than 10)

Cancel | Submit

Total integrations: 3

for "Expand Groups..."



Reports

Calculation selected: 8, Mode: nirspec fixed_slit

Report | Warnings | Errors

Downloads

Instrument Filter/Dispenser: f170lp/g235h

Extraction Aperture Position (arcsec): [0.00, 0.00]

Wavelength of Interest used to Calculate Scalar Values (microns): 2.00

Size of Extraction Aperture (arcsec): 0.15

Total Time Required for Strategy (seconds): 191.63

Total Exposure Time (seconds): 191.63

Extracted Flux (e-/sec): 2.14

Standard Deviation in Extracted Flux (e-/sec): 0.20

Extracted Signal-to-Noise ratio: 10.48

Input Background Surface Brightness (MJy/sr): 0.28



Issues to think about when using ETC

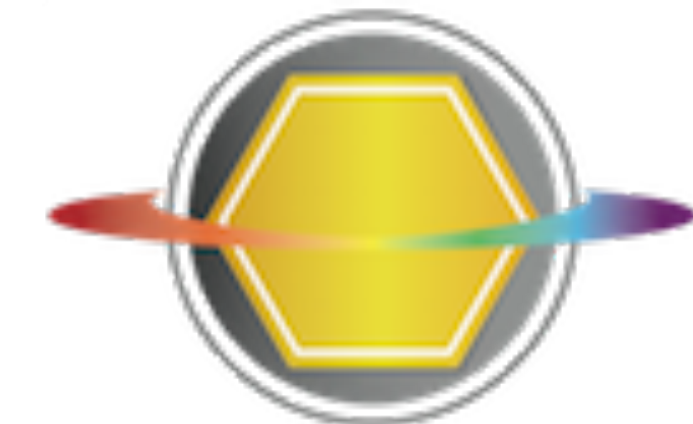
- **There are many parameters affecting ETC sensitivities and program preparation**
 - Different read-out patterns change the read noise
 - Be aware of saturation
 - Which background subtraction scheme?
 - Is the background correct for your target?
 - What extraction aperture is optimal? (Point or extended source?)
- **Remember:** The ETC approximates our current best knowledge and understanding of the performance of the JWST instruments. There are remaining uncertainties associated with system throughputs, detector noise properties, etc., which will not decrease until the observatory is in flight. Users should exercise appropriate caution when interpreting results from the ETC.
- The ETC is not intended to be a complete observation simulator
 - Some higher-order effects are not taken into account, such as field distortion

A few known issues in ETC v1.2

- https://jwsthelp.stsci.edu/?id=kb_category&kb_category=2ee97706db36764042685434ce961909
- **Accuracy**
 - Extinction calculation assumes a simple relationship between magnitude and column density, and will be inaccurate for sources with extremely steep gradients
 - NIRSpec read noise is underestimated for some readout patterns
 - No support for mode-dependent flat field errors
 - Coronagraphy assumes “optimal” subtraction is possible and may overestimate true performance
- **Yet to be implemented**
 - No explicit support for dithers
 - Workaround: treat *Nexposures* as the number of dither positions, which will decrease correlated flat field noise approximately similarly to the effect of multiple dithers
 - <https://jwst-docs.stsci.edu/display/JPP/Residual+Flat+Field+Errors+in+the+ETC#ResidualFlatFieldErrorsintheETC-Butmyobservationwillhavelotsofdithers.WhatshouldIdo?>
 - Not possible to have NIR ramps with *Ngroups*=1 (sometimes desirable for very bright object modes)
- **Consistency with APT**
 - Some detector parameter limits used by APT, are not implemented in the ETC → **Users are always advised to check with APT for allowed ranges and combinations of detector parameters**

Future release schedule

- <https://jwst.etc.stsci.edu/>
 - Current release - v1.2 - December 2017
 - **Next release - v1.2.2 - 14-16 March 2018**
 - Future major release - v1.3 - some time in May/June 2018
- **Before GO1 submission deadline:**
 - check whether the release notes of the latest version mention relevant issues for your program
 - reload your ETC workbooks, recalculate, and verify that the results have not changed



JWST ETC



STScI



Useful links

- **JWST ETC (v1.2 - December 2017 - version for GO Cy1)**

- <https://jwst.etc.stsci.edu/>

- **Documentation: ETC introduction and links to all pages**

- <https://jwst-docs.stsci.edu/display/JPP/JWST+Exposure+Time+Calculator+-+ETC>

- **ETC release notes, known issues and FAQ (@ JWST Help Desk)**

- https://jwsthelp.stsci.edu/?id=kb_article&sys_id=f781d8e0db318b44fb50f9baae961997

- https://jwsthelp.stsci.edu/?id=kb_category&kb_category=2ee97706db36764042685434ce961909

- https://jwsthelp.stsci.edu/?id=kb_category&kb_category=5d8affc2db36764042685434ce961998

- **JWST Community Lecture Webcasts**

- "Pandeia: The JWST Exposure Time Calculator" - Klaus Pontoppidan (17 Jan 2017)

- <https://webcast.stsci.edu/webcast/detail.xhtml?talkid=5387>

- "JWST ETC Demo" (interface demonstration) - Swara Ravindranath (21 Feb 2017)

- <https://webcast.stsci.edu/webcast/detail.xhtml?talkid=5418>



ST&I

