

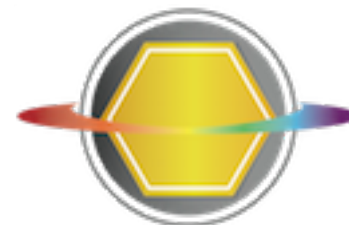
# The JWST Exposure Time Calculator

Tim Rawle (ESA@STScI)

28-June-2017

# 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/>



JWST ETC



STScI



- **JWST ETC (v1.1 - June 2017)**

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

- **Documentation: ETC overview and usage**

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

- **ETC known issues (@ JWST Help Desk)**

- [https://jwsthelphelp.stsci.edu/?id=kb\\_category&kb\\_category=2ee97706db36764042685434ce961909](https://jwsthelphelp.stsci.edu/?id=kb_category&kb_category=2ee97706db36764042685434ce961909)

- **JWST Community Lecture Webcasts**

- “Pandeia: The JWST Exposure Time Calculator” (general introduction)

- 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>

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[SPIE Proceedings | Volume 9910 | Program and Observation Scheduling II >](#)

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Proceedings Article

## Pandea: 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

Pandea 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, JWST SCUM detector readout correlations, detector noise, and



**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

## - ETC engine available for download

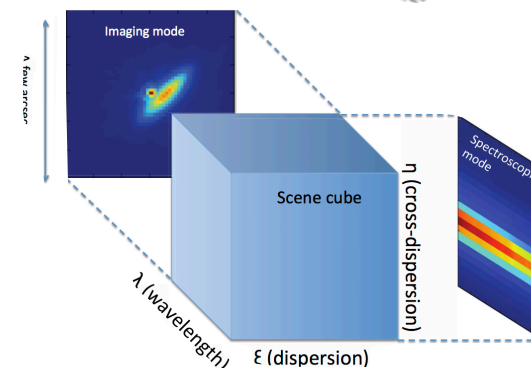
- <http://ssb.stsci.edu/pandeia/engine/1.0/>
- More functionality than web application (although no access to the JWST background model)

## - Web application recommended for most users

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

## - 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
- Choreography
- 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

### News

Welcome to version 1.1 of the JWST ETC!

This version features faster performance, new target acquisition modes, improved timing models, and more: see the [Release Notes](#) for details.

When you log in to the 1.1 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 version 1.0 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 1.1 and Out-of-Date Workbooks](#)

Please see the [Known Issues](#) page for 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**.

## User Guide

### System Performance

Calculation run times for certain instrument modes (NIRISS WFSS, 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.

## Available Workbooks

# ▾	Name -	⚠	Load	Description -	Options
5958	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]
5959	Sample Coronagraphy Calculations		[Load]	MIRI and NIRCам coronagraphy calculations using three faint sources, one central star, and one reference source	[copy][remove]
5960	Slitless & IFU calculations		[Load]	Slitless and IFU calculations performed on scenes with multiple extended sources	[copy][remove]

Help Desk & User Guide

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

Create New Workbook

Get a Copy of a Sample Workbook ▾

## User Access Permissions for Slitted Spec (including MSA)

User Email

Add User by Email

User ▾	Read	Write	Grant	Revoke
anon_3073	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

## - 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

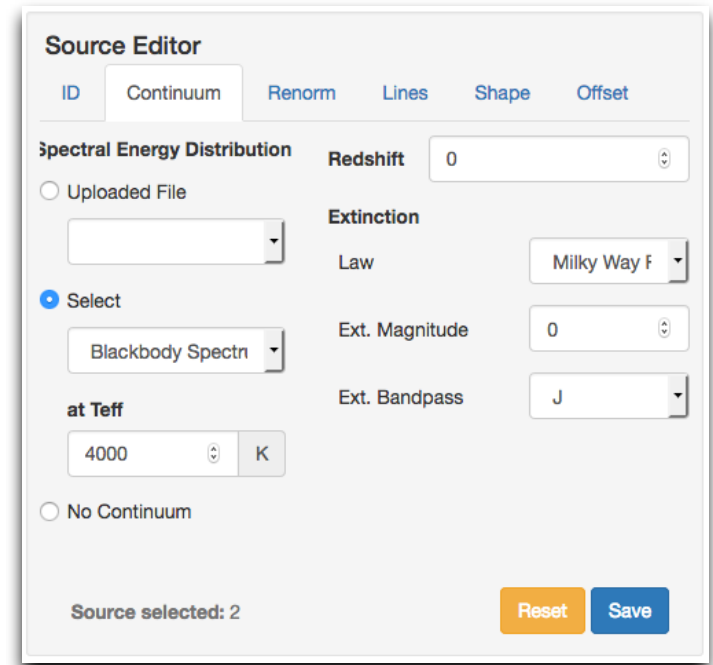
## - 2 - Create one or more scenes

- 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 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  $\lambda$
  - Upload a spectrum: ASCII or FITS format  
( <https://jwst-docs.stsci.edu/display/JPP/JWST+ETC+User+Supplied+Spectra> )
  
  - For extended sources: flat, service, 2D Gaussian profile



The screenshot shows the 'Source Editor' window with the following settings:

- Tab: Continuum
- Buttons: ID, Renorm, Lines, Shape, Offset
- Spectral Energy Distribution:  Uploaded File,  Select
- Redshift: 0
- Extinction Law: Milky Way F
- Ext. Magnitude: 0
- Ext. Bandpass: J
- at Teff: 4000 K
- No Continuum
- Source selected: 2
- Buttons: Reset, Save

Exposure Time Calculator    Edit    Expand    anon\_3073    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

### Select a Scene

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

Scenes table

New    Add Source    Remove Source

### Select a Source

ID	PlotName	Scenes	# Calcs
1	Star 1	1,2	7
2	Star 2	2	2

Sources table with checkbox to select for plotting

New    Delete

### Configuration pane

#### 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    at

JWST    MIRI/IMAGING    F560W

HST    WFC3/IR    F098M

Source selected: 2    Reset    Save

### Scene Sketch

2: double\_source

output

### Source Spectrum Plots

#### Source Spectrum

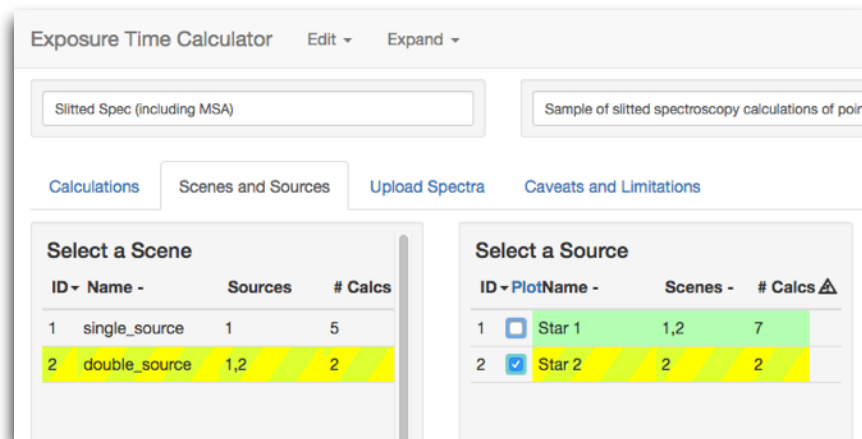
microns

Calculations    Source Warnings

#### Source Errors

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_lrs slit	1
10	nirspec_fixed_slit	1

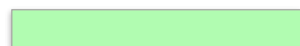
affected calculations



- **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**

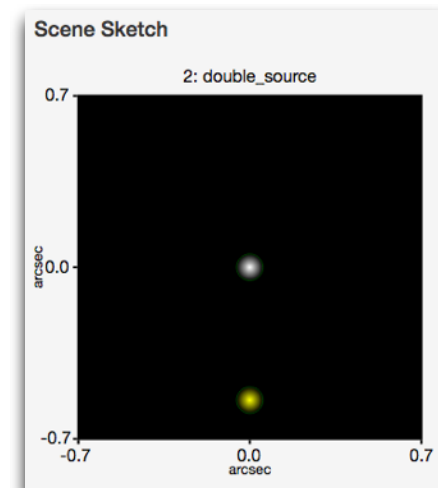


Selected scene is displayed in the sketch



Selected source is displayed in yellow

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





Exposure Time Calculator
Edit ▾ Expand ▾
anon\_3073 ▾ 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

Calculations table

MIRI ▾	NIRCam ▾	NIRISS ▾	NIRSpec ▾	ID ▾	Plot	Mode -	Scene -	(s) -	SNR -	⚠
				10	<input type="checkbox"/>	nirspec fixed_slit	1	191.54	74.96	✓
				9	<input type="checkbox"/>	miri lrslit	1	277.50	0.45	✓
				8	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	191.54	10.42	✓
				7	<input type="checkbox"/>	nirspec msa	2	440.21	44.89	✓
				6	<input type="checkbox"/>	nirspec msa	2	440.21	0.44	✓
				4	<input type="checkbox"/>	nirspec msa	1	440.21	44.25	✓
				1	<input type="checkbox"/>	nirspec msa	1	440.21	47.52	✓
				-	-	---	-	---	---	-

Configuration pane

Scene ★
Backgrounds
Instrument Setup
Detector Setup
Strategy

**Select Scene for Calculation**

1: single\_source ▾

**Sources in that Scene**

1: Star 1 ▾

**Offset**

---

**Normalize Source Flux Density**  
Renormalization applied after redshift

Normalize at wavelength

Normalize in bandpass

JWST MIRI/IMAGING ▾ F560W ▾

Calculation selected: 8, Mode: nirspec fixed\_slit

Reset
Calculate

Exposure Time Calculator Edit Expand anon\_3073 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

**Configuration pane**

MIRI ▼ NIRCam ▼ NIRISS ▼ NIRSpec ▼

ID▲	Plot	Mode -	Scene -	(s) -	SNR -	▲
10	<input type="checkbox"/>	nirspec fixed_slit	1	191.54	74.96	<input checked="" type="checkbox"/>
9	<input type="checkbox"/>	miri lrslit	1	277.50	0.45	<input checked="" type="checkbox"/>
8	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	191.54	10.42	<input checked="" type="checkbox"/>
7	<input type="checkbox"/>	nirspec msa	2	440.21	44.89	<input checked="" type="checkbox"/>
6	<input type="checkbox"/>	nirspec msa	2	440.21	0.44	<input checked="" type="checkbox"/>
4	<input type="checkbox"/>	nirspec msa	1	440.21	44.25	<input checked="" type="checkbox"/>
1	<input type="checkbox"/>	nirspec msa	1	440.21	47.52	<input checked="" type="checkbox"/>
-	-	---	-	---	---	-

**Calculations table**

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

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

Background configuration  
 None  Low  Medium  High

Date Apr 1 2019

Calculation selected: 8, Mode: nirspec fixed\_slit Reset Calculate

Exposure Time Calculator Edit Expand anon\_3073 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▲	Plot	Mode -	Scene -	(s) -	SNR -	▲
10	<input type="checkbox"/>	nirspec fixed_slit	1	191.54	74.96	✓
9	<input type="checkbox"/>	miri lrslit	1	277.50	0.45	✓
8	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	191.54	10.42	✓
7	<input type="checkbox"/>	nirspec msa	2	440.21	44.89	✓
6	<input type="checkbox"/>	nirspec msa	2	440.21	0.44	✓
4	<input type="checkbox"/>	nirspec msa	1	440.21	44.25	✓
1	<input type="checkbox"/>	nirspec msa	1	440.21	47.52	✓
-	-	---	-	---	---	-

**Calculations table**

**Configuration pane**

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

Exposure Time Calculator Edit Expand anon\_3073 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	Plot	Mode	Scene	(s)	SNR	
10	<input type="checkbox"/>	nirspec fixed_slit	1	191.54	74.96	✓
9	<input type="checkbox"/>	miri lrslit	1	277.50	0.45	✓
8	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	191.54	10.42	✓
7	<input type="checkbox"/>	nirspec msa	2	440.21	44.89	✓
6	<input type="checkbox"/>	nirspec msa	2	440.21	0.44	✓
4	<input type="checkbox"/>	nirspec msa	1	440.21	44.25	✓
1	<input type="checkbox"/>	nirspec msa	1	440.21	47.52	✓
-	-	---	-	---	---	-

**Configuration pane**

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

Subarray: S200 A1 Readout pattern: NRS

Groups: 10 Integrations: 3 Exposures: 1

Total exposure time: 00:03:11 (191.54 s)

Total integrations: 3

Calculation selected: 8, Mode: nirspec fixed\_slit Reset Calculate

**Calculations table**

Exposure Time Calculator
Edit ▾ Expand ▾
anon\_3073 ▾ 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 ▾	Plot	Mode -	Scene -	(s) -	SNR -	▲
10	<input type="checkbox"/>	nirspec fixed_slit	1	191.54	74.96	<input checked="" type="checkbox"/>
9	<input type="checkbox"/>	miri lrslit	1	277.50	0.45	<input checked="" type="checkbox"/>
8	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	191.54	10.42	<input checked="" type="checkbox"/>
7	<input type="checkbox"/>	nirspec msa	2	440.21	44.89	<input checked="" type="checkbox"/>
6	<input type="checkbox"/>	nirspec msa	2	440.21	0.44	<input checked="" type="checkbox"/>
4	<input type="checkbox"/>	nirspec msa	1	440.21	44.25	<input checked="" type="checkbox"/>
1	<input type="checkbox"/>	nirspec msa	1	440.21	47.52	<input checked="" type="checkbox"/>
-	-	---	-	---	---	-

## Configuration pane

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

**Aperture radius**

**Perform Background Subtraction Using**

background region

noiseless sky background

**Sky annulus**

Inner radius

Outer radius

Angular units

Wavelength of Interest (1.66 - 3.17)

Calculation selected: 8, Mode: nirspec fixed\_slit

Reset
Calculate

Calculations table

# Calculations page (lower half - results)

9	<input type="checkbox"/>	mini irssit	1	277.50	0.45	<input checked="" type="checkbox"/>
8	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	191.54	10.42	<input checked="" type="checkbox"/>
7	<input type="checkbox"/>	nirspec msa	2	440.21	44.89	<input checked="" type="checkbox"/>
6	<input type="checkbox"/>	nirspec msa	2	440.21	0.44	<input checked="" type="checkbox"/>
4	<input type="checkbox"/>	nirspec msa	1	440.21	44.25	<input checked="" type="checkbox"/>
1	<input type="checkbox"/>	nirspec msa	1	440.21	47.52	<input checked="" type="checkbox"/>

Calculations table

**NOTE:** Scene are reusable.  
Errors and warnings are indicated in the calculations table



Centered on source

0.15 arcsec

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

Angular units: arcsec

Perform Background Subtraction Using

background region

noiseless sky background

Sky annulus

Inner radius: 0.3 arcsec

Outer radius: 0.5 arcsec

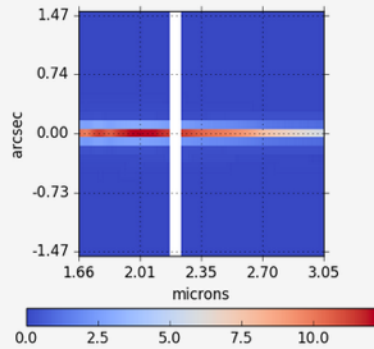
Calculation selected: 8, Mode: nirspec fixed\_slit

Reset Calculate

## Images

Calculation selected: 8, Mode: nirspec fixed\_slit

2D SNR Detector Saturation



2D SNR Image

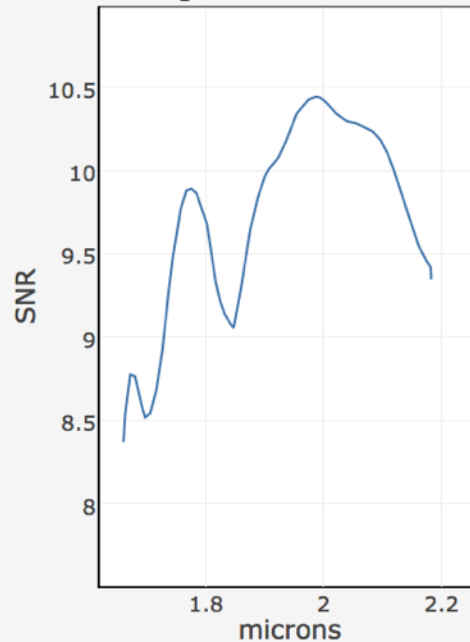
2D output

## Plots

### 1D output

ApFlux ApBackground SNR SNR (time) Contrast

#### Signal to Noise



## Reports

Calculation selected: 8, Mode: nirspec fixed\_slit

Report Warnings Errors

Downloads

Instrument	f170lp/g235h
Filter/Disperser:	
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):	191.54
Total Exposure Time (seconds):	191.54
Extracted Flux (e-/sec):	2.14
Standard Deviation in Extracted Flux (e-/sec):	0.21
Extracted Signal-to-Noise ratio:	10.42
Input Background Surface Brightness:	0.28



## Reports

Calculation selected: 6, Mode: nircam wfgism

Report

Warnings

Errors

Downloads

Instrument Filter/Disperser:	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  $\lambda$  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 intermediate and output products
- FITS files of 3D data cube for IFU
- 2D images and spectra
- extracted flux, combined backgrounds, SNR as FITS table

# Exploring the parameter space

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 [Save]

Total integrations: 3

for Ngroups

ID	Plot	Mode	Scene	(s)	SNR	
15	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	266.29	14.99	✓
14	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	247.60	13.91	✓
13	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	228.91	12.78	✓
12	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	210.23	11.62	✓
11	<input checked="" type="checkbox"/>	nirspec fixed_slit	1	191.54	10.42	✓
10	<input type="checkbox"/>	nirspec fixed_slit	1	191.54	74.96	✓
9	<input type="checkbox"/>	miri irsslit	1	277.50	0.45	✓
8	<input type="checkbox"/>	nirspec fixed_slit	1	191.54	10.42	✓
7	<input type="checkbox"/>	nirspec msa	2	440.21	44.89	✓
6	<input type="checkbox"/>	nirspec msa	2	440.21	0.44	✓
4	<input type="checkbox"/>	nirspec msa	1	440.21	44.25	✓
1	<input type="checkbox"/>	nirspec msa	1	440.21	47.52	✓

Scene: MIRI | Backgrounds | Instrument Setup | Detector Setup | Strategy

Subarray: S200 A1 | Readout pattern: NRS

Groups: 10 | Integrations: 3 | Exposures: 1

Total exposure time: 00:03:11 (191.54 s)

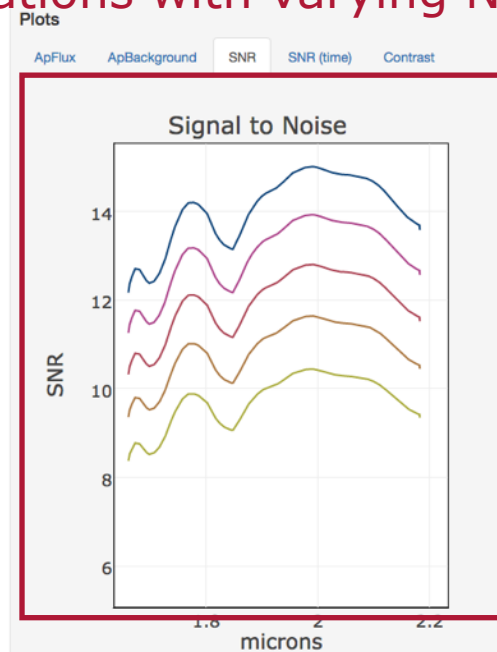
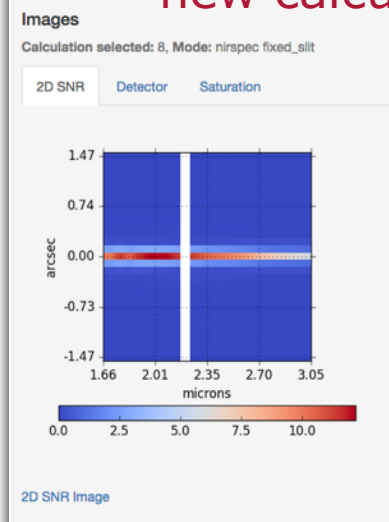
Total integrations: 3

Calculation selected: 8, Mode: nirspec fixed\_slit

[Reset] [Calculate]

new calculations with varying Ngroups

- Access batch configuration via the "Expand" menu:
  - Ngroups
  - Nints
  - Filter set (for imaging modes)



Reports

Calculation selected: 8, Mode: nirspec fixed\_slit

Report | Warnings | Errors

Downloads

Instrument: f170lp/g235h

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): 191.54

Total Exposure Time (seconds): 191.54

Extracted Flux (e-/sec): 2.14

Standard Deviation in Extracted Flux (e-/sec): 0.21

Extracted Signal-to-Noise ratio: 10.42

Input Background Surface Brightness (M<sub>λ</sub>/sr): 0.28



- **There are many parameters affecting ETC sensitivities**
- Which background subtraction?
- Is the background correct for your target?
- What extraction aperture is optimal? (Point or extended source?)
- Different read-out patterns change the read noise
  
- The ETC does cut some computational corners... e.g.
  - distortion is not considered in most instrument modes
  - extinction calculation assumes a simple magnitude/column density relationship, not suitable for all sources
  
- **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 orbit. Users should exercise appropriate caution when interpreting results from the ETC.

- **JWST ETC (v1.1 - June 2017)**

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

- **Documentation: ETC overview and usage**

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

- **ETC known issues (@ JWST Help Desk)**

- [https://jwsthelphelp.stsci.edu/?id=kb\\_category&kb\\_category=2ee97706db36764042685434ce961909](https://jwsthelphelp.stsci.edu/?id=kb_category&kb_category=2ee97706db36764042685434ce961909)

- **JWST Community Lecture Webcasts**

- “Pandeia: The JWST Exposure Time Calculator” (general introduction)

- 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>