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JWST ETC Scenes and Sources Page Overview

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The "Scenes and Sources" page in the [JWST Exposure Time Calculator \(ETC\)](#) contains an overview of all scenes and sources in a workbook. Users can also create, edit, and inspect their scenes and sources.

Introduction

The "Scenes and Sources" page contains an overview and an editor for all scenes and sources within the workbook. From this page, it is possible to [create new scenes](#), associate sources with scenes, [edit scene and source parameters](#), view a representation of your scene, inspect the spectrum of your sources, and view which calculations currently contain your sources.

Scene and source tables

Tables in the "Scenes and Sources" page are interactively linked, and provide visual cues for the relationship of scenes and sources. When a scene is selected in the "Scene" table, all sources contained in that scene will be highlighted in green in the "Source" table. Conversely, when a source is selected in the "Source" table, all scenes containing that source will be highlighted in green in the "Scene" table. For convenience, we refer to green highlighted rows as *affected* by the selected row in the other table. It is possible for a row to be both selected in its own table (yellow) and affected by the selection in the other table (green): in this case, the row appears with yellow and green striping.

Both tables are also interactively linked with the "Used in Calculations" table in the lower right. This table lists all calculations in the workbook. All calculations that are affected by the selected scene (i.e., it uses that scene) or source (i.e., the scene it uses contains that source) will be highlighted in green. All affected calculations will be automatically updated when the selected source or scene is changed.

These tables allow the user to see and manage the scope of any changes to sources and scenes. A recommended workflow is to perform detailed manipulation on sources and scenes that are not yet used by any calculations.

Defining scenes and sources

Sources



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JWST Exposure Time Calculator

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Creating a source

Sources contain the spatio-spectral information that will be used in the scenes and calculations. Creating a new source via the  button within the "Select a Source" pane will result in a new default source (point source, flat spectrum). This source is initially not associated with any scene, and must be explicitly added to a scene using the  button within the "Select a Scene" pane.

Editing a source

The specific information for the source can be edited in the "Source Editor" pane. To edit the source information, the user must first select a source from the "Select a Source" pane. Navigation is done by selecting a tab within the editor, as listed below:

ID

Contains the identity information for both the source and the scene. It is where the user can change the default name and create descriptive references to the source or scene.

Continuum

Contains options for the spectral energy distribution, extinction to be applied, and the redshift information for the source's spectrum.




Renormalization


Allows a user to renormalize a source's flux either at a particular wavelength, or in a normalization bandpass. Instrument-specific HST and JWST bandpasses are offered, as well as more general photometric bandpasses.

Note: Currently the renormalization in surface brightness units for extended sources is not supported.

Lines

Allows the user to add spectral lines to the source's spectrum. Currently, only emission features are supported.

- To add a line, the user must first input four values: a user-defined name for the line, the line center (in μm), the line width (in km/s), and the line strength (in $\text{erg}/\text{cm}^2/\text{s}$). Once these values have been provided in their respective fields, clicking the  button will include the line in the line table.
- To edit a line, simply select the line by clicking the appropriate row in the line table. The input fields will be automatically populated with the current values of that line. Simply change the values displayed in the input fields to edit the currently selected line. Once changes have been made, click the  button. The line table row should now be updated with the new values.
- To remove a line select the appropriate row in the line table and click the  button.

Note: After defining all the lines, you must click the  button to apply them to the source spectrum.

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Shape

Allows the user to define the source as either a point source or an extended source. Choosing extended allows for flux distribution and axial extent options.

Offset

Contains options for the position of the selected source within the selected scene such as adding spatial offsets, or giving the source some orientation.

Note: There must be a source added to a scene before entries in the Offset tab will take effect.

Saving and Resetting

You may move between these tabs while editing the source, but you must click SAVE before selecting a different source in the source table, or your changes will be lost. Clicking the RESET button will revert your changes to the most recently saved values.

Scenes

Scenes are idealized representations of spatial (two angular coordinates) and spectral brightness distributions, before being observed by a telescope. They are composed on 'postage stamps,' that is, relatively small areas of ~10–20 square arc seconds (Table 1 shows the default and maximum scene size that will be used in the calculation, centered on scene center for each instrument/mode pairing). Although not a fundamental limitation, this restriction conserves computational resources and reduces the time for calculations. Scenes also contain the source targets of an observation, and all other nearby sources that could contribute to both the observed target and background fluxes.


Table 1. Default and maximum scene size used in the calculation


Instrument	Mode	Default scene size (arcsecs)	Max scene size (arcsecs)	Dynamic
MIRI	Imaging	6.05	40.0	True
	LRS Slitted	6.05	10.0	True
	LRS Slitless	6.00	30.0	True
	MRS IFU			False
	Coronagraphy			False
NIRCAM	LW Imaging	4.00	20.0	True
	SW Imaging	2.00	10.0	True
	SS Grism	2.00	10.0	True
	WF Grism	2.00	10.0	True
	Coronagraphy			False
NIRISS	Imaging	4.00	20.0	True
	SOSS	16.9	16.9	False


Instrument	Mode	Default scene size (arcsecs)	Max scene size (arcsecs)	Dynamic
	WFSS	15.0	75.0	True
	AMI			False
NIRSPEC	Fixed Slit	3.00	20.0	True
	Imaging	3.00	20.0	True
	MSA	3.00	20.0	True†
	IFU			False


† Indicates whether the scene is dynamic. If true, the scene will grow to encompass all specified sources up to the maximum scene size. The scene sizes refer to the width on each side. Not all modes support dynamic scenes. If Dynamic scene is False, the scene size is set by the PSF footprint taken from the PSF library, which varies based on the observing mode settings.


Adding sources to scenes


An empty workbook, for a user just starting out, will initially contain a default scene and a default point source. To add a scene, click the  button at the bottom of the "Select a Scene" pane. The user will find that the table has been populated with a new scene, and selecting this scene will allow the user to view an idealized representation in the "Scene Sketch" pane below.

To create a new source, a user must click the  button in the "Select a Source" pane, to the right.

After having created a new source object, the user will have to explicitly associate the source with a scene, as it is possible to have multiple scenes that contain the same source. To do so, the user must select the desired source in the source pane, select the scene to which the source will be associated, and click the  button. The previously yellow highlighting of the selected scene and source will now be visible as a striped green and yellow pattern. The newly added source will now be visible at the center of the scene sketch. You may now use the **Offsets** tab to place it at the desired location (refer to the ["Sources and Scene" Tables](#) section for a more in-depth explanation of the color scheme). Likewise, the "Scene Sketch" pane should now display the idealized 2D flux image of the scene.

To remove a source, select your scene and the associated source and click the  button. This will not **delete** the source, but only remove its association with the scene object. Again, the user will notice that the source has been removed from the "Scene Sketch" pane.

To delete a scene, select a scene and click the  button at the bottom of the pane.

 Note that if there exists a calculation that contains the scene, the user will not be able to remove the scene without first modifying the calculation to use a different scene, or simply

deleting the calculation. The column "# Calcs" displays the number of calculations that contain the scene.

Viewing scenes and source

Scenes and source properties are presented in the two lower panes: "Scene Sketch", and "Source Spectrum Plots". The Scene Sketch is interactively linked with the Source Table. A selected source will appear yellow in the sketch, and clicking on a source in the sketch will select its row in the Source Table. Selecting a scene will automatically update the "Scene Sketch" pane with an idealized (i.e. before being observed by a telescope) representation of the sources within that scene. The source is directly influenced by the settings within the "Source Editor" pane; e.g. the idealized sources will reflect the shape and offset parameters defined by the user.

Selecting a source will automatically check its "Plot" checkbox and show its spectrum in the "Source Spectrum Plots." Multiple sources can be compared by manually checking their "Plot" check boxes. For convenience, the "Plot" column heading is a drop-down that allows the user to check "All" or "None" of the entries for plotting. The extent of the plot axes may also be controlled by setting the bounds below the spectra plot and clicking the `apply` button.

While the "# Calcs" column of the "Select a Scene" and "Select a Source" panes tell the user how many calculations the scene(s) and/or source(s) are used in, users may wish to refer to the "Used in Calculations" pane to view the specific calculations affected by a change in the selected source or scene. The "Used in Calculations" pane displays any calculations that any source or scene are actively used in, but selecting a source or scene will correspondingly highlight the associated calculation(s) in green.

Related links

[JWST Exposure Time Calculator, ETC](#)

[JWST Exposure Time Calculator Overview](#)

[JWST ETC Creating a New Calculation](#)

[JWST ETC Defining a New Scene](#)

[JWST ETC Defining a New Source](#)

[JWST ETC User Supplied Spectra](#)

References

go to the on-line [JWST Exposure Time Calculator Tool](#)

[Pontoppidan, K. M., Pickering, T. E., Laidler, V. G. et al., 2016, *Proc. SPIE* 9910, Observatory Operations: Strategies, Processes, and Systems VI, 991016](#),
"Pandeia: a multi-mission exposure time calculator for JWST and WFIRST"