

**JWST Proposal Planning Workshop, ETC Demonstration**  
**AAS 235, January 3<sup>rd</sup>, 2020, 9:45-10:30**

**Before starting:** Let participants know that when many people create the same calculation at the same time, ETC performance may take a hit. For those who learn best by watching, please do so! Otherwise, be patient with the ETC.

**Front page**

- Go to [jwst.etc.stsci.edu](http://jwst.etc.stsci.edu).
- Briefly discuss the News item in red.
- Point out the Help box and the two items in it.
- Discuss the top banner, which is present on every ETC page.
- The Help dropdown has links to the documentation, release notes, known issues, and the JWST Help Desk.
- Now discuss the four buttons:
  - *Quick Start*: A good place to start, provides a guided walkthrough of the most basic ETC functionality.
  - *Create User*: Create a MyST account.
  - *Log In*: Log in with your MyST account and save your workbooks.
  - *Work Anonymously*: Work without saving workbooks.
- For those without a MyST account, and who would like to save workbooks over the next 2 hours, please take this time to go through the process of creating an account by clicking on the Create User button.
- In the meantime, I will walk through the Quick Start mode.

**Quick Start**

- Click on Quick Start.
- You will always open a workbook on the Calculations tab. Right now there are only 2 tabs; the other two will show up after the tutorial ends.
- Point out the 4 dropdown menus for the 4 science instruments.
- Select a MIRI Imaging calculation.
- Click on the Scene tab. You can modify the default point source brightness here.
- Then go to the Detector Setup tab and change the number of groups from 100 to 10. Click Calculate.
- Discuss the pop-up message. Click OK. Show how to log in from this page.

- Note the two additional tabs that just showed up: Scenes and Sources and Upload Spectra. These will be discussed more later.
- Click on the Exposure Time Calculator banner to return to the home page.

### **Overview of a workbook**

- Now select Work Anonymously. I don't want to save this workbook, but you may want to, so you can instead choose to Log In.
- Show how to create a new workbook, then load it.
- Mention how this opens a new tab in your browser and keeps the Available Workbooks page open in a different tab.
- Describe the Workbook ID, Title, and Description boxes. The ID cannot be altered and is unique for each workbook. Changes to the Title and Description will update automatically.
- Change the Title to "Demonstration Workbook" and the Description to "AAS 235, January 2020".
- Switch to the browser tab with the Available Workbooks page and show how the Title and Description have been updated. Then switch back to the workbook.
- Move to the Scenes and Sources tab and point out that there is a default scene and source available in every new workbook.
- Note: You cannot delete the default scene, but you can re-use it. Also, there are sometimes weird behaviors from deleting the default source, so it is best to repurpose it rather than delete it.

### **Run MIRI Imaging calculation**

- Now return to the Calculations tab.
- Create a MIRI Imaging calculation.
- Highlight the calculation and view the Calculation Editor pane.
- Describe each of the tabs, briefly.
- Show the Images, Plots, and Reports panes.
- Then return to the Instrument Setup tab and change the filter to F2550W. Click Calculate.
- After it completes, point out the orange exclamation point and go to the Warnings tab in the Reports pane. The background is saturating and the suggestion is to decrease the number of groups.
- Go to the Detector Setup tab and describe each of the options.

- Click on the CSH link to go to the JDOX page on Understanding Exposure Times. Describe what groups, integrations, and exposures are, and how the readout pattern and subarray affect the total time.
- What should the new number of groups be? Go to the Reports tab and find the “Maximum Number of Groups Before Saturation” quantity.
- This value is 22. Type 23 and show that saturation still occurs. Type 22 and see that the orange exclamation point becomes a green check mark, indicating no saturation.
- Now go the Instrument Setup tab and select the F560W filter. Click Calculate.
- Find the Maximum Number of Groups Before Saturation again. This value is 6447. Type this number in to the groups box and note the orange warning text. The calculation can still be run.
- This is almost 5 hours of integration time, which is not feasible due to cosmic rays. This demonstrates that this strategy is not always effective.

### **Run NIRSpec BOTS calculation**

- Now create a NIRSpec Fixed Slit/BOTS calculation.
- On the Instrument Setup tab, change the slit to the S1600A1 slit, which is the only slit that can be used for the BOTS (Bright Object Time Series) mode. Leave the grating set to Prism/CLEAR so the whole wavelength range can be covered.
- Go to the Backgrounds tab and click on the CSH link. Scroll to the bottom of the page. Copy and paste the Kepler FOV coordinates into the Position box.
- Set the Date for Oct 1 2021. Transits have set times when they can be observed, so setting a date is a good idea. Otherwise, you can set a background percentile based on what you estimate the background could be at the position of the target.
- Now go to the Detector Setup tab.
- Leave the Subarray the same and change the Readout Pattern to NRSIRS2 to show the red warning. The lower-noise IRS2 patterns cannot be used for BOTS (they can only be used with the FULL subarray). Change the Readout Pattern to NRS instead. Click Calculate.
- Let’s aim for an SNR of ~3. This requires trial and error testing of values, but is achieved for Ngroups=70.
- Following the strategy outlined for the previous calculation is not sensible for time series because you want a particular SNR per data point. Increasing the number of integrations or exposures is therefore not meaningful.

### **Run NIRCcam TA calculation**

- For a third type of calculation, create a NIRCcam TA calculation.
- Note the extremely low SNR and the warning that the SNR is below 30. It is highly encouraged that you attempt to exceed this value, otherwise the TA algorithm may not be able to identify your target and the observation will not be performed.
- Note the options on the Instrument Setup tab. TA should only be used for Time Series and Coronagraphic Imaging; standard imaging should not require TA because the FOV is so large.
- At present there is only one filter available for Time Series; an additional, narrow-band filter will be made available in ETC 1.5.1 for brighter targets. Since our target is faint, it is OK to proceed with this filter.
- Now move to the Detector Setup tab.
- There is only one option for the Subarray, Integrations, and Exposures. This is typical for TA calculations.
- Can we increase the SNR to be over 30? The maximum number of groups is 65 (the other values are not used) and the longest group time is for the DEEP8 readout pattern.
- Changing these values and clicking Calculate results in an SNR of only ~4. This is one instance where the target is too faint for TA. As a workaround, you would need to identify a brighter target nearby to use as an offset TA target which would be acquired and then a small offset applied to place the science target in the aperture. This is something specified in APT; there are no capabilities for this in the ETC, though the SNR will need to be evaluated for the offset target in the ETC.

Thank you for following along with the ETC demo. We will now take a short break and return at 10:45 for the ETC Hands-On Session.