JWST APT Mosaic Tile Splitting Activity

In certain cases, it may be necessary to split off one or more tiles from a larger mosaic in order to find guide stars. This page describes how to do that task.

Introduction

> *Main article: JWST APT Mosaic Planning*
> *See also: video help on Mosaics: Specifying Mosaics in APT*

Mosaicking in APT is a key functionality for many science use cases. In certain circumstances, usually because of guide star availability versus time, one or more tiles of a larger mosaic need to be split off from the main mosaic in order to permit the main mosaic to be schedulable. The simplest situation is if the problem tile or tiles can simply be dropped. However, if complete spatial coverage is required, these split tiles need to be scheduled at a different time when guide stars are available for them. (Often, other adjustments are also needed to fill the gap or gaps left by the removal of a tile.) Furthermore, for data processing purposes, the observations of the split tile (s) need to stay associated with the main mosaic observation in order for the Data Management System (DMS) to produce the final mosaic.

The APT Visit Planner provides diagnostic plots and other information that allows the user to identify problem tile (s). Then, special requirements and a tool within the mosaic environment of APT allow the user to split off the problem tile or tiles while maintaining the necessary associations for the data processing system downstream.

How to split mosaic tiles

The steps for finding and scheduling problem tile(s) are outlined below. It assume that the Visit Planner (VP) has been run on a mosaic observation that has unschedulable tiles.

Find the problem tile or tiles

- Take note of the total number of visits in your observation.
- In the visit planner window, right click on the observation and select **Display Guide Star Availability by V3PA** (V3 position angle) for the diagnostic plot.
- Determine the number of problem tiles.
    - For example, if the mosaic contained 12 visits but the plot only has 11 visits, then (a) there is no time when all 12 visits get guide stars simultaneously, and (b) the best you can do is to schedule at a time (an angle) when all but one tile have guide stars.

- Hover the cursor over the green line in a section where most visits have guide stars, and note the visit(s) and V3PA at those time. (You will need this for the next steps outlined below.)

Removing the problem tile or tiles

- Click on **Form Editor** to return to your mosaic observation, then click on the Special Requirements tab to open the special requirements (SR) panel.
- Select a SR for specifying the aperture position angle (APA) range and enter the V3PA obtained in the previous section. (That is, set the mosaic to a V3PA where most of the tiles are schedulable.)
    - For example, if the analysis from the previous section showed that 11 visits were schedulable at a V3PA of 263°, set the **PA Range** (position angle range) SR to the values 263 to 263.
    - Note: the APA is often close to the V3PA, but it's not exactly the same; for some targets and/or instrument configurations, it can be significantly different. After entering the APA values in the **PA Range** SR, the SR panel in the GUI will also display the V3PA values, in parenthesis, that corresponding to the APA . Adjust the APA, if necessary, to get the V3PA derived from the diagnostic plot.
- Next, click on the **Mosaic Properties** tab for the observation to see the mosaic panel. There is a table at the bottom of it that shows which visits correspond to which tiles in the mosaic. Identify the tile(s) that contains the problem visit or visits. For those tiles, click the column tab that says, **Split tile to new observation**. Wait for the GUI to update (which may take a few seconds).
- When the GUI has been updated, here's what you should see:
    - A new target has been automatically created for the removed tile.
    - A new mosaic observation folder has been created. In this folder you should see (a) the original mosaic observation, minus the problem tile, and (b) a new observation for the missing tile. The presence of both these observations together in the mosaic observation folder will tell the data management system to associate the observations in data processing.

Fixing the problem tile or tiles

- In the form editor, select the newly-created problem tile observation.
- Click on the **Special Requirements** tab to remove the APA range special requirement from the SR panel.
- Go to the visit planner, and run the scheduler by clicking **Update Display**. If the processed observation comes back with a green check mark, that means there is a time slot when the problem tile has guide stars. If the observation comes back with a red X, then there are no time slot when this visit (tile) will have guide stars.
- Look at the V3PA diagnostic messages (click on the **Reports** button to select the appropriate report) as before. Hover over a horizontal line segment in the plot line for a schedulable time, and record the V3PA. Note: you may want to choose a V3PA as close to the original main mosaic angle to minimize the problem of filling the gap left by the tile removal, but this is not always possible.
- Go to the form editor for the new observation, click on the **Special Requirements** tab to open the SR panel, and fix the orientation of the new observation using the value determined above.
- Run the visit planner again on this observation to confirm its schedulability.
- View the new observation folder in Aladin. What do you see?

- You should see the main mosaic at the prescribed APA, and the new split observation showing the problem tile at the other fixed orientation you specified. Note that since the angles have been set to specific values in this process, Aladin is showing the exact coverage that can be expected from the actual observations.
  - It is likely that the new observation does not fill the gap in the original mosaic very well, depending on the angular offset of the new observation relative to the main mosaic. So now what do you do?
- The split observation has simply inherited whatever properties were in the original mosaic observation. The selected dither pattern may not work well in the new orientation, so you may need to adjust it.
- Also, you may need to add an additional tile to the new observation and adjust the positions to obtain complete spatial coverage of the gap from the removed tile.

Restrictions and planned improvements

APT version 25.4.2 (January 2018), still only allows the removal of a single tile at a time. Plans are under discussion for allowing the removal of multiple problem tiles (and possibly the fixing thereof) simultaneously.

Another functionality under discussion is the idea that one could use the mosaic tool to define a mosaic, then explode each tile out into a separate observation. (This functionality has been useful for HST mosaic planning but is not yet in the JWST part of APT.) Then the Smart Accounting tool would take care of removing the unnecessary slews and perform the proper accounting for the separated observations.