2023-02-22 TSO WG Meeting notes

Date

22 Feb 2023

Attendees

- Sarah Kendrew
- Unknown User (birkmann)
- Brian Brooks
- Nikolay Nikolov
- Everett Schlawin
- Nestor Espinoza
- Leonardo Ubeda
- Knicole Colon
- Achrène Dyrek

Meeting agenda:

1. News & Announcements (all).
2. TSO WG work updates:

   (a) TSO visits/schedule monitor (Nikolov)
   (b) Non-linearity as measured by TSOs (Espinoza)
   (c) 1/f noise work updates (Espinoza)
   (d) Zodiacal background measurements (all)

3. Deeper dive into MIRI TSO performance (Sarah)
4. Instrument roundtable check-in (all).

Discussion items

Time	Item	Who	Notes
5 mins	**1. News & announcements**		• Sarah Kendrew introduces Achrène, who is joining us to talk about MIRI TSO, which is work she's been doing a lot of work on this.
	TSO work tasks updates		
	2. TSO visit /schedule monitor (Nikolay Nikolov)		Still working through it, nothing to report.
	3. Non-linearity as measured by TSOs (Espinoza)	Nestor Espinoza, Leonardo Ubeda	Comparing non-linearity offsets across datasets seems the errors/offsets are the same accross datasets
	4. Zodiacal background measurements	all	Nikolay Nikolov shares that the idea is to look at the background impact of a fainter star like HAT-P-14b. They are thinking on observing that. Nestor Espinoza a NIRISS/SOSS program is going to get in.
MIRI TSO Performance			

		Sarah Kendrew	• She introduces the presentation (see slides). It will involve: 390 Hz noise, jump step, non-linearity correction and different • **The 390 Hz noise** is this feature you see as "small wiggles" at the pixel level, which oscillates between integrations. The fluctuation is a 9-row oscilation, and repeats on a 4 integration cadence. Frequency spectrum shows strong peak at 390.6 Hz. Visible in all subarrays. Likely caused by control voltage generator circuits "bleeding" into the output signal. • Interestingly, according to Mike Ressler you can substract this out quite well at the pixel level by simple sinusoid fitting. Background substraction that Jeroen does also works well. Possible that if you move the subarray away from the edge, you might get rid of this entirely! This means increasing the frame time, however — so you lose dynamic range. Not clear if this is something that should be done or not (might be science dependant; perhaps for coronographic science it makes sense, but for TSOs perhaps not — requires a tradeoff analysis). • **Excess noise at short wavelengths**. You see somewhat larger errors than expected for wavelengths < 7 um. There's analyses happening by e.g., Achrene, Pierre-Olivier and Jeroen, Jürgen. The non-linearity solution is an important component that corrects for this, but this is not the entire story; errors due to the RSCD effect seem to be important, too — this is actually the most important part of this error (RSCD "masqueraded" as non-linearity). You can get rid of the RSCD if you exclude the first N groups of the ramp (N = 4, 5?). If you have small number of groups, this is not possible to correct. Nestor Espinoza asks wether you could correct this directly from the data — Sarah Kendrew believes it might, but its important to consider that the effect is flux dependant! • **Non-linearity corrections.** Jeroen Bouwman has done analyses on which you can extract a custom non-linearity correction for a given dataset and "correct" for effects like the above. Interestingly, not doing that can create some visual transit depths differences, and also "transits" appearing on the FWHM. Nestor Espinoza asks how come this was not observed on the commissioning target; Everett Schlawin suggests it might be the difference in transit depth (commisioning was 500 ppm). • **Shadowing**. Sarah Kendrew introduces the "shadowing effect" (see Bell+2023 for details), which is a region of the detector which is illuminated differently to the rest, and for which thus prior illumination might be impacting differently (which causes different systematic trends). • **Detector settling**. It seems this might be dependant on prior ilumination, or filter before observing. Some datasets show this, some others don't — it seems most important for phase-curves. Achrene has been looking at what the cause is via telemetry (e.g., checking what filter wheel was used prior to the exposure). Idea is to correlate this against what is seen — a lot of work, as you have to do it for every single TSO! Everett Schlawin asks if there's any "smoking gun" yet to understand this? Sarah Kendrew notes that no, this is under investigation. Nikolay Nikolov asks whether there are calibration ideas similar to what is done on HST/WFC3, as to do "pre-flashing" versus "not"? Sarah Kendrew it seems its much harder to do with JWST than with Spitzer — slew time is longer; by the time you slew from bright star to target effect might be gone. If this is indeed the case, the solution would be to park the filter with a suitable filter. Nikolay Nikolov asks whether scheduling could be done too. For instance, do TSOs not after a particularly high background. Sarah Kendrew suggests that yes, potentially, but adding another constraint on already constrained observations might make it much more difficult.
	NIRCam	Nikolay Nikolov	
	NIRISS	Nestor Espinoza	Nestor Espinoza reports some SOSS observations that failed during the weekend. All is solved now, issues has been identified.
	NIRSpec	Unknown User (birkmann)	
	MIRI	Sarah Kendrew	
2 mins	**4. Closing Remarks**		