NIRSpec TSO Pipeline Issues and Status

Keyes (3 June 2020)

Goals:

1. Evaluate high-priority pipeline issues.
2. Rank all outstanding unprioritized issues (TBD as needs some discussion)
3. Include additional items not identified in TSO Dashboard list or not specifically enumerated which affect more than just TSO, but are significant for TSO (i.e., things like extract1d and rectification)

TO DO Each TSO WG member will have a look at the unprioritized tickets that touch on their respective instruments and provide prioritization for the next biweekly.

TO DO Each member will also have a look at the different high-priority tickets in order to provide information/status on them on the next biweekly.

URLs for dashboards and other info used as sources:

NIRSpec DMSWG Dashboard: <https://jira.stsci.edu/secure/Dashboard.jspa?selectPageId=17609>

TSO DMSWG Dashboard (all SI): <https://jira.stsci.edu/secure/Dashboard.jspa?selectPageId=17613>

Alicia Qtrly Presentation notes: <https://outerspace.stsci.edu/pages/viewpage.action?pageId=70458100>

TSOWG mtg notes: <https://outerspace.stsci.edu/display/JTEWG/2020-05-20+TSO+WG+Meeting+notes>

(Includes actions)

**Key:**

GREEN highlighting: affects NIRSpec TSO

YELLOW highlighting: status or actions to be performed

**>>> from DMSWG TSO Dashboard (17613):**

In testing:

* JP-1437 B7.6 ref files
  + currently open; B7.6 updates due 31 Jul; impacts TSO
* JP-1436 B7.6 algorithm specifications
  + Identifies need for completing B7.6 updates by 26 June

Ready for Testing: (this section includes only items identified in table as impacting NIRSpec)

* JP-250 cal pipeline should be able to calibration segmented TSO files
  + Process large datasets correctly; NIRCam OK, NIRSpec needs to test,
  + This is also listed in the Low Priority section
* JP-84 define extended source for NIRSpec modes (and MIRI)
  + Applies to all modes; probably no extended use case for TSO
  + Ticket lists as “major” priority? – this ticket not listed in any priority category below
* JP-49 dealing with noise sources
  + Uncertainties in LS ramp fitting only include photon and read noise at present;
  + Not generally applicable to BOTS as TSO typically photon noise limited
  + Affects all modes
  + May have been subsumed by other tickets? Probably subsumed by generalized LS ticket (JP-267)
  + This is also listed in the Low Priority section

**All Unprioritized tickets: (we need to establish priorities for those affecting NIRSpec)**

* JP-1478 Enable use of extract\_1d reference file for NRC\_TSGRISM data OPEN
  + NIRCam-specific; separate from NIRSpec extract\_1d issues
* JP-1342 Unclosed files error from some pipeline steps Ready for Testing
  + Did impact TSO2,3 but issue closed – no NIRSpec-specific impact
  + Problem only produces warnings
* JP-1177 Support JSOCINT-123 for NIRISS SOSS exposures with mixture of filters OPEN
  + no NIRSpec impact
* JP-905 Calibrating Moving targets shadow observations OPEN
  + Affects all SI; is listed as impacting TSO - Is there a use case for MT TSO?
  + Does shadow observation need to be TSO?
  + Priority Recommendation: Low unless required for significant science case
* JP-5 Gain for subarrays OPEN
  + Is this a NIRISS-only issue? NIRSpec does not implement “stripe” mode
  + counts in ADU/second will be different in a sub-array measurement as opposed to in full-frame depending on whether the read-out is four channel or one channel read-out
  + If important would impact TSO as well as all slit modes

Additional New Ticket (currently unprioritized:

* JP-1488 NIRSpec BOTS data need to be rectified
  + NIRSpec-specific; NIRSpec considers CRITICAL (and highest priority)
  + Currently, calwebb\_tso-spec2 is set to skip this step, which leads to incorrect spectral products because the extract\_1d algorithm is not written to account for the spectral curvature
  + Resample testing has been performed for MOS; only preliminary tests for FS have been examined at present
  + What is impact of rectification on TSO?

Critical Priorities: (green may impact NIRSpec)

* JP-1469 Add min/max wavelength range for flux summation in TSO white light calculation OPEN MIRI, NIRCAM, NIRISS
  + late May addition - why no inclusion of NIRSpec in SI affected? Ticket does indicate BOTS; apparent oversight
  + NIRSpec implementation info and issues:
    - NIRSpec reference files in assign WCS step are used for assignment of wavelengths based on location on detector – specify operable wavelength range for each grating/filter
      * If these assignments are based on throughputs, then should exclude MOST of noisier pixels – whether NIRSpec files are optimized for this or not needs testing
    - If as described in related JP-1355 below, the approach were to simply skip fluxcal step for NIRSpec, major complications would arise and require significant re-work as throughput and other corrections are not part of fluxcal.
* JP-1427 resample\_spec & cube\_build need option to use internal coordinates for NIRSpec internal lamp processing OPEN NIRSPEC
  + Is there a significant AUTOWAVECAL use case for BOTS? If so, priority is critical
* JP-1371 Implement spectroscopic aperture extraction corrections In Progress MIRI, NIRCAM, NIRSPEC, NIRISS
  + Probably our highest priority for TSO
  + For extract\_1d, would impact TSO and white light and should be critical
  + Need reference files (see JP-967 above); reference files have been delivered
  + For some reason is listed as unprioritized in NIRSpec Dashboard
* JP-1355 Flux summation in white\_light step of TSO3 OPEN NIRCAM, NIRISS
  + Added 16 May; why is NIRSpec not included?
  + Similar to JP-1371 above, but here different options are suggested (e.g., sensitivity weighting or use el/sec)
  + If were to simply skip fluxcal step for NIRSpec or attempt wavelength-dependent weighting of sensitivity correction, major complications would arise for NIRSpec and may require significant re-work as throughput and other corrections are not part of fluxcal.
  + Duplicate entry in High section below
* JP-201 Update Extract-1d for NIRISS SOSS Reopened NIRISS
  + NIRISS-specific; use trace for extraction
  + If applicability to future optimal pipeline extraction, possible NIRSpec-related applicability

High Priority: (which apply to NIRSpec)?

* JP-1437 Build 7.6 reference files OPEN
  + Impacts all modes and SIs (duplicate entry. Also listed as in testing)
* JP-1412 Improve method of combining integrations within an exposure OPEN
  + Looks like imaging only – no NIRSpec BOTS applicability
  + Duplicate listing below in medium section
* JP-1407 Updates to background subtraction strategies for MIRI LRS OPEN
  + Not applicable to NIRSpec BOTS
* JP-1355 Flux summation in white\_light step of TSO3 OPEN
  + Impacts NIRSpec
  + duplicate entry as also listed in Critical priorities
* JP-1353 Extreme memory usage of TSO1 on small input files OPEN
  + Impacts all SIs, unclear significance of impact
* JP-1300 Refactor TSGRISM WCS transforms OPEN
  + no NIRSpec impact
* JP-1285 Outlier detection flagging too many pixels with default settings OPEN
  + NIRCam-reported issue not clear that impacts other Sis?
  + NIRSpec has not yet performed comprehensive testing of outlier detection
* JP-1280 Outlier detection should not use propagated uncertainties OPEN
  + Affects all SIs; what is significance?
  + NIRSpec has not yet performed comprehensive testing of outlier detection
  + Should use std dev
* JP-1124 Build 7.3 resample\_spec yields empty array Ready for Testing
  + MIRI-only; no NIRSpec impact
* JP-223 Identify position brightest object in TSO observations without TA OPEN
  + MIRI-only; no NIRSpec impact

Medium Priority: (green apply to NIRSpec)

* JP-1412 Improve method of combining integrations within an exposure OPEN
  + Looks like imaging only – no NIRSpec BOTS applicability
  + Duplicate from above in high section
* JP-1270 Update exposure level products OPEN
  + Impacts tso3, could not detrmine what this is
* JP-277 Optimal TSO Spectral Background Subtraction OPEN
  + No discussion updates since Sep/Dec 2018; comments state use Default option should be "column-by-column" with linear fit for NIRISS, NIRCam, and MIRI.  Default for NIRSpec should be median of entire BG region.
  + could impact white light summation quality
  + pertains to “optimal pipeline”; not a pre-launch priority?
  + Duplicate in Low section below

Low Priority: (determine which apply to NIRSpec)

* JP-1175 Update outlier detection docs to explain scaling used for TSO data OPEN
  + Documentation update; appears to apply only to imaging TSO, not NIRSpec BOTS
  + Expect to be low in any event
* JP-1065 Discuss philosophies involving step parameter reference file creation In Progress
  + Affects all SIs and modes; more information needed as the issue is not clear
  + Expect to be low in any event
* JP-278 Optimal TSO Photometry Extraction OPEN
  + Imaging only; no NIRSpec BOTS impact
* JP-277 Optimal TSO Spectral Background Subtraction OPEN
  + Duplicate in Medium section above – see comments there
* JP-252 Optimal target centroiding for TSO imaging data OPEN
  + MIRI-only; no NIRSpec impact
* JP-251 Implement Optimal Extraction for spectroscopy and TSO spec data OPEN
  + Likely would impact NIRSepc but no mention in actual text
  + Could impact white light summation quality
* JP-250 Calibration Pipeline should be able to calibrate segmented TSO files Ready for Testing
  + duplicate from ready for testing section – see above
* JP-49 Dealing with Noise sources Ready for Testing
  + duplicate from ready for testing section – see above

**>>>> end of 17613 dashboard items : DMSWG TSO dashboard**

**>>>> 17609 dashboard items : NIRSpec DMS dashboard (not specifically TSO)**

Critical NIRSpec DMS priorities: (includes only those that may impact NIRSpec TSO)

* JP-1150 Extract\_1d aperture should be centered at planned source location in progress
  + Mainly for MOS as source not centered; not an issue for BOTS
  + Will use target sky position of target to center extraction
  + Works on resampled and sums flux in column
* JP-1071 flat\_field calspec2 step failing validation for FS ALLSLITS BOTS and MOS open
  + Affects BOTS; needs to be resolved; probably straightforward
  + Working for NRS2 presently and also for full frame
  + (f-flat is where wavelength dependence is applied for NIRSpec; have capability (not used) for additional delta correction in fluxcal)
* JP-1213 Master background algorithm improvement for NIRSpec open
  + Not used with BOTS; only for cases with background in other exposures (e.g., nods, dithers)
  + Can affects slit observations; currently processed as extended, fair amount of work to implement

Reference file ticket list:

* JP-1111 enhanced aperture photometry in pipeline source lists open ???
  + Does not affect BOTS
  + Placeholder - What is “enhanced”
  + Point source image photometry not for us
* JP-967 NIRSpec “spectroscopic” aperture correction reference files
  + Affects all point sources, extract\_1d – accurate info needed to test accuracy of BOTS white
* JP-645 basic (baseline) aperture photometry in pipeline source lists (ready for testing)
  + Does not affect BOTS
  + circular aperture photometry; imaging only

Unprioritized tickets: (do any impact NIRSpec TSO; what would be priority?)

* JP-1372 update NIRSpec master background subtraction OPEN
  + Does not affect BOTS
  + This ticket is analogous to JP-1213, but for MOS only
* JP-1371 implement spectroscopic aperture extraction corrections in progress
  + Listed as critical priority in TSO Dashboard but unprioritized here
  + Probably our highest priority for TSO
  + For extract\_1d, would impact TSO and white light and should be critical
  + Need reference files (see JP-967 above); reference files have been delivered
* JP-1357 saturation step update needed open
  + Documentation issue, not algorithm; may be MIRI only we’re not sure
  + Unclear that this affects NIRSpec TSO
  + We need to describe why two saturation levels are identified
  + Priority is low to medium in any event

**NIRSpec DMS Tickets from 17609 dashboard (continued)**

High priority:

* No TSO-relevant high priority tickets listed

Medium priority:

* JP-891 nirpsec master background products open
  + Does not affect BOTS
  + Output 1d master and 2d resampled background; could be used for allslits
* JP-269 implement optimal spectral flat field correction open
  + Use AUTOFLAT instead of canned AUTOFLAT exposure
  + possibly useful in rare cases, but not required for NIRSpec TSO
  + Canned AUTOFLAT exposure S/N not appropriate to most TSO

Low priority:

* JP-267 update optimal ramp fitting open
  + TSOWG may want to look into and make recommendation as may improve CR? (would be a step for “optimal pipeline” )
  + Stage1 pipeline generalized LS fits to use statistics when calculate slope of ramp
  + Is this related to JP-49 found in TSO Dashboard?
  + Will not be worked before launch
  + Listed as unprioritized in ticket metadata
* JP-265 implement optimal saturation flagging open
  + Pipeline reporting only – no processing impact?
  + Flag saturated data in grouped data? Would apply to all modes; reports info appropriate to CR localization uncertainty in ramp.
  + TSOWG may wish to consider as an occasionally useful reporting product; obtain more details
  + Ideally only for fainter targets (frame averaging)
  + Listed as unprioritized in ticket

**>>>> end of 17609 dashboard items : NIRSpec DMS dashboard**

**>>>>>> End**