



STScI | SPACE TELESCOPE
SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

Status of candidate enhancements for Cycle 1 (focus on overheads and efficiencies)

Jeff Valenti
JWST Mission Scientist @ STScI

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Overview of presentation

- Status of *candidate* launch-delay enhancements
 - Organized by category

| Code | Category |
|------|------------------------|
| OE | Observing efficiency |
| DQ | Data quality |
| UT | User tools |
| SC | New science capability |
| SE | S&OC enhancement |

- More detail provided for work completed or in progress ⓘ
 - Most enhancements are listed in launch delay letter, but some new ones
- Bug fixes
- Priorities for JWST work by Instrument Division over next 6 months



Science enhancements – Observing efficiency (OE)

| JIRA Ticket | ID | OSS | Build* | Description | |
|--------------|--------|------------|-----------------|---|--------------------------|
| n/a | OE1 | No | IC 14.45 | Precompile scripts → Compile scripts more quickly (ISIM) | <i>i</i> |
| JWSTOSS-6882 | OE2a | Yes | OSS 8.1 | Reuse exposure setup (NIRCam) | <i>i</i> |
| JWSTOSS-6917 | OE2b | Yes | OSS 8.2 | Reuse exposure setup (MIRI) | <i>i</i> |
| JWSTOSS-6881 | OE2c | Yes | | Reuse exposure setup (NIRSpec) | <i>i</i> |
| JPPS-261 | OE3a | No | PPS 14.9 | Enable more coordinated parallel combinations | <i>i</i> |
| JSOCINT-159 | OE3b | No | PPS 14.10 | Enable more pure parallel combinations | <i>i</i> |
| JSOCINT-164 | OE4 | No | PPS 14.9 | Maximize FOV of WFSS observations (NIRISS) | <i>i</i> |
| JSOCINT-208 | OE5 | No | PPS 14.8 | Package IFU mosaic in one visit | <i>i</i> |
| JSOCINT-143 | OE6 | Yes | | Enable NIRCam SW+LW coronagraphy | |
| JSOCINT-201 | OE7 | Yes | | Enable NIRSpec IFU + MOS prism | |
| JSOCINT-308 | (OE) | No | PPS 14.9 | Move guide star ID attitude closer to science attitude | <i>i</i> |

*Build: Bold means enhancement already implemented, blank means not yet allocated to a build



A brief history of OSS script compile time

- Script compile times grew substantially after OSS 5
 - Added dithers, parallels, target acquisition, and other capabilities
 - Many more #include statements in each MAIN script
 - Compilation took an order of magnitude longer than predicted by APT
- ISIM FSW team investigated precompiling lower-level scripts
 - Measured compile times using prototype software on an unloaded system
 - Dramatic reduction in compile times for all MAIN scripts
- ISIM FSW team tuned compiler settings
 - Substantial reduction in compile times without precompiling lower-level scripts
 - Compile times are now shorter than predicted by APT



Quicker script compilation (OE1)

| Instrument | Activity | APT 27.1 | Before Change | After Change |
|------------|----------------------------|----------|---------------|--------------|
| FGS | Guide star acquisition | (282) | 103 | 9 |
| MIRI | Per exposure specification | 25 | 157 | 16 |
| | TA | | 135 | 17 |
| NIRCam | Per exposure specification | 40 | 373 | 19 |
| | TA | 30 | 262 | 19 |
| | End of visit | 30 | 135 | 4 |
| NIRISS | Per exposure specification | 30 | 150 | 13 |
| | TA | 30 | 147 | 16 |
| NIRSpec | Per exposure specification | 65 | 229 | 21 |
| | TA (MSA) | 30 | 237 | 25 |
| | TA (bright object) | 30 | 269 | 23 |
| | End of visit | 30 | 29 | 7 |



Faster detector setup for dithered/repeat exposures (OE2)

| Template | PRIME | | | | PARALLEL | | | | Overhead Reduction |
|---|-----------|---------|---------|--------------|-----------|---------|---------|--------------|--------------------|
| | nactivity | ntotexp | nrepeat | overhead | nactivity | ntotexp | nrepeat | overhead | |
| NIRCam Imaging | 846 | 3463 | 2617 | 73040 | 1212 | 3668 | 2456 | 68547 | 0.93% |
| NIRCam Wide Field Slitless Spectroscopy | 300 | 1092 | 792 | 22105 | | | | | 0.14% |
| NIRCam Coronagraphic Imaging | 300 | 460 | 160 | 4466 | | | | | 0.03% |
| NIRCam Grism Time Series | 25 | 25 | 0 | 0 | | | | | 0.00% |
| NIRCam Time Series | 1 | 1 | 0 | 0 | | | | | 0.00% |
| TOTAL – NIRCam | | | | 99611 | | | | 68547 | 1.10% |
| MIRI Imaging | 544 | 1920 | 1376 | 19952 | 272 | 1664 | 1392 | 20184 | 0.26% |
| MIRI Medium Resolution Spectroscopy | 937 | 2950 | 2013 | 29189 | | | | | 0.19% |
| MIRI Coronagraphic Imaging | 84 | 379 | 295 | 4278 | | | | | 0.03% |
| MIRI Low Resolution Spectroscopy | 44 | 70 | 26 | 377 | | | | | 0.00% |
| TOTAL – MIRI | | | | 53795 | | | | 20184 | 0.49% |
| NIRSpec MultiObject Spectroscopy | 903 | 2681 | 1778 | 21016 | | | | | 0.14% |
| NIRSpec IFU Spectroscopy | 665 | 2071 | 1406 | 16619 | | | | | 0.11% |
| NIRSpec Fixed Slit Spectroscopy | 63 | 147 | 84 | 993 | | | | | 0.01% |
| NIRSpec Bright Object Time Series | 19 | 19 | 0 | 0 | | | | | 0.00% |
| TOTAL – NIRSpec | | | | 38628 | | | | | 0.25% |



Enable more coordinated parallel combinations (OE3a)

| Prime Template | Parallel Template |
|------------------------|---------------------------|
| MIRI Imaging | NIRCam Imaging |
| | NIRISS WFSS |
| NIRCam Imaging | NIRISS WFSS |
| | MIRI Imaging |
| | NIRISS Imaging |
| (NIRCam WFSS) | (MIRI Imaging) |
| | (NIRISS Imaging) |
| NIRISS WFSS | MIRI Imaging |
| | NIRCam Imaging |
| NIRSpec MOS | NIRCam Imaging |
| | (MIRI Imaging) |

Parenthetical items in **bold** are candidates for implementation in PPS 14.9, which will be released before the GO call for proposals



Enable more pure parallel combinations (OE3b)

Added **NIRISS WFSS** as a pure parallel option

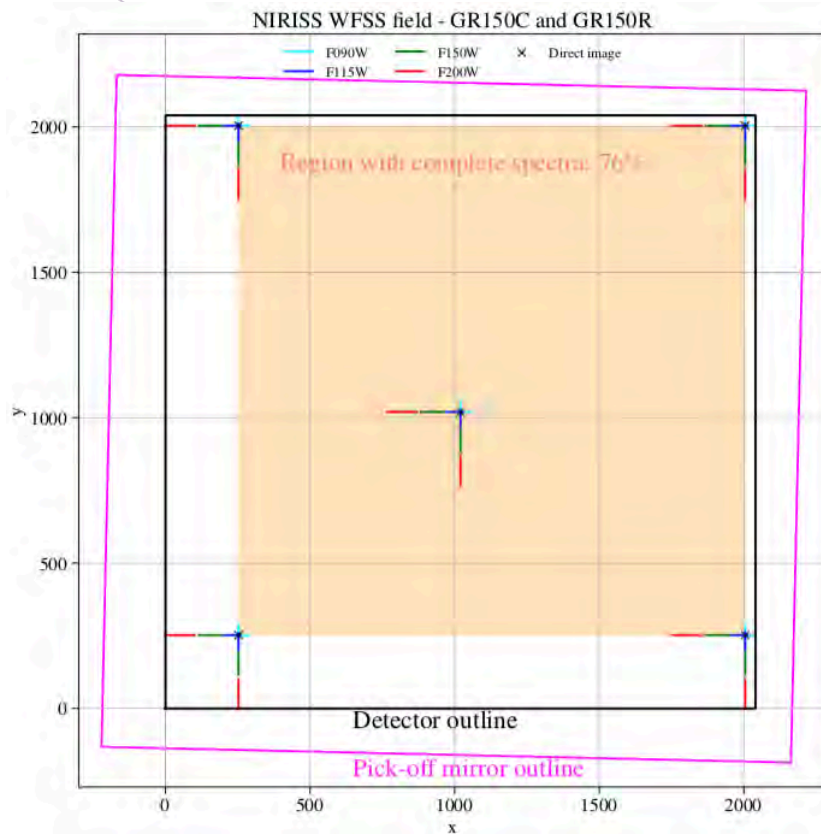
Allowed parallel templates:

- NIRCам Imaging
- MIRI Imaging
- NIRISS Imaging
- **NIRISS WFSS**
- (NIRCам WFSS)

| Prime Template | Parallel Template |
|----------------|---------------------------------|
| MIRI Imaging | NIRCам Imaging |
| | NIRISS WFSS |
| | (NIRCам WFSS – Priority 1) |
| NIRCам Imaging | MIRI Imaging |
| | NIRISS Imaging |
| | NIRISS WFSS |
| NIRISS WFSS | MIRI Imaging |
| | NIRCам Imaging |
| NIRSpec MOS | NIRCам Imaging |
| | (MIRI Imaging – Priority 2) |
| NIRSpec IFU | (NIRCам Imaging – Priority 3) |
| | (MIRI Imaging – Priority 4) |



NIRISS WFSS currently gets complete spectra for 76% of FOV



Location of NIRISS WFSS spectra at 5 direct image positions for the operations concept currently implemented. Direct image locations are marked with a black cross. Grism spectra are shown with colored lines for different filters. The black square outline shows the 2040x2040 active pixels on the detector. The outline of the oversized pick-off mirror is shown in magenta. **Only sources within the orange region have all of their spectra on the detector.** This region comprises 76% of the total direct image area.



Maximize FOV of NIRISS WFSS observations (OE4)

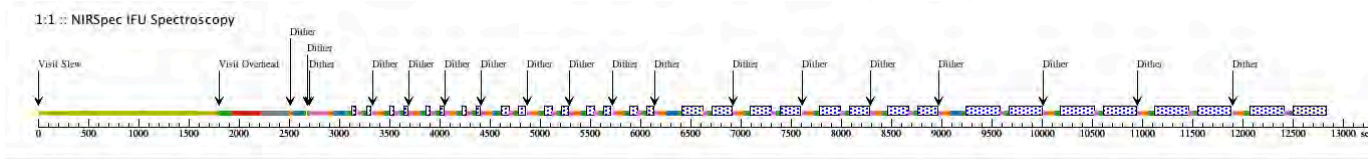
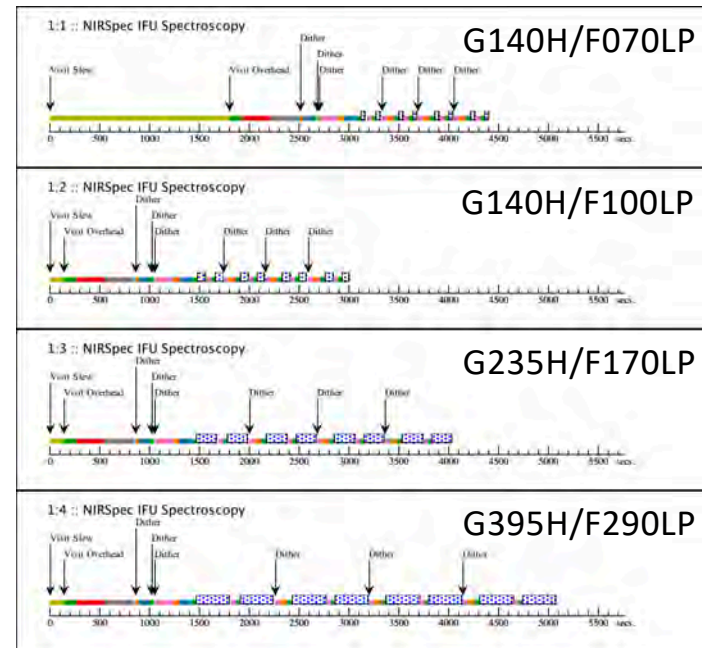
- Chris Willot, Gabe Brammer, Paul Goudfrooij, and Swara Ravindranath show that without any telescope offsets between NIRISS direct images and grism exposures, only 76% of the sources in the direct image will have complete spectra from 0.88 to 2.23 microns.
- They analyzed two revised observing sequences, where filter-dependent telescope offsets provide better overlap of imaging and spectral regions.
 - Both options improved overlap from 76% to 89%, **increasing efficiency by 17%**.
 - Option 2 is preferred because direct images are obtained at some of the exact same positions as grism exposures, enabling higher accuracy astrometric and wavelength solutions.



Package IFU mosaic in one visit (OE5)

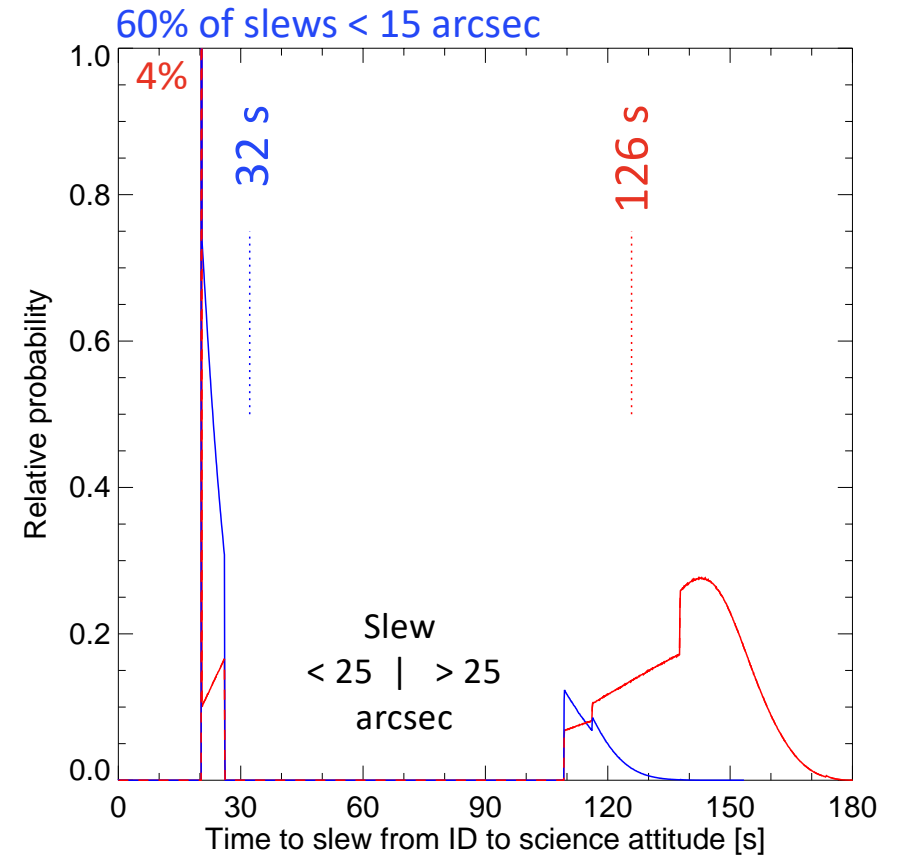
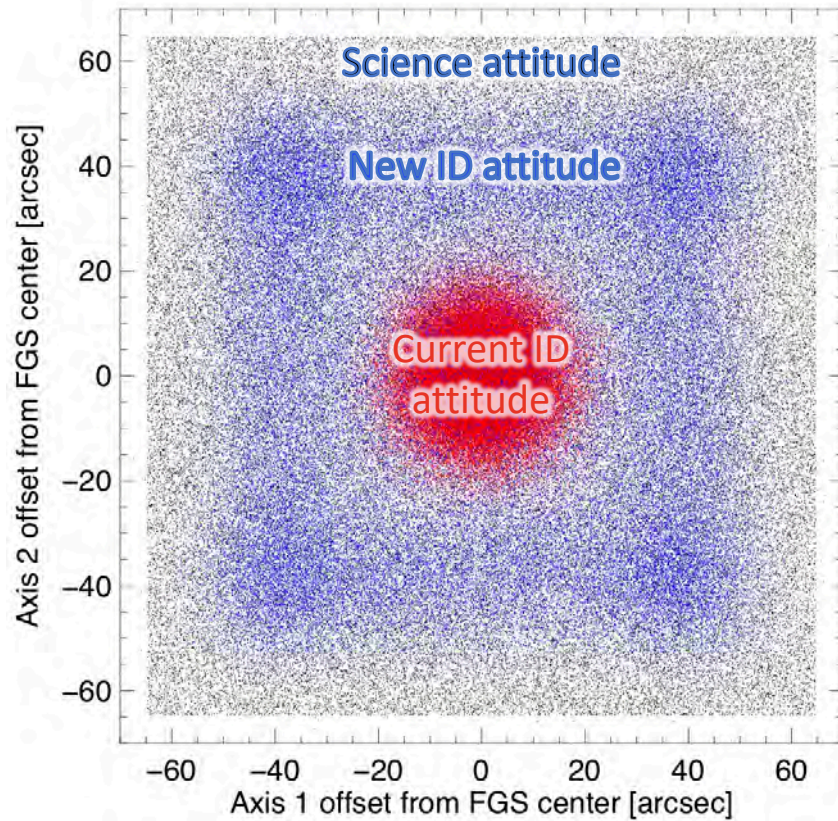
PPS 14.7 – Each visit contains one disperser and all tiles.

PPS 14.8 – One visit contains all dispersers and all tiles.





Move guide star ID attitude closer to science attitude (OE)





Faster slew during guide star acquisition (OE)

- 1080 GTO + 188 ERS visits = 1286 visits → 1286 guide star acquisitions
- Save 94 seconds per guide star acquisition (on average)
- Save $1286 * 94 \text{ s} = 120884 \text{ s}$
- GTO + ERS programs will take 15250783 s (with observatory overheads)
- **Recover 0.8% (120884/15250783) of mission lifetime for science**
- Observatory overheads include additional guide star acquisitions





Science enhancements – Data quality (DQ)

| JIRA Ticket | ID | OSS | Build | Description |
|---------------|--------|-----|---------|--|
| JP-290 | DQ1 | No | | Put image products in Gaia astrometric frame (in progress for HST) |
| JSOCINT-282 | DQ2 | Yes | | Enable moving target "shadow" observations (modify FSW) |
| JSOCINT-192 | DQ3 | Yes | | Enable TA in IRS2 detector mode |
| Tracking page | DQ4 | No | | Improve data calibration algorithms |
| JSOCINT-123 | DQ5 | Yes | OSS 8.2 | Enable SOSS+F277W calibration |
| JSOCINT-75 | DQ6 | Yes | OSS 8.2 | Enable TA confirmation image for MIRI LRS |
| | DQ7 | Yes | | Enable read-reset-read detector mode (modify ASIC registers) |
| | DQ8 | Yes | | Enable read-reset detector mode (modify ASIC firmware) |
| | DQ9 | Yes | | Improve ASIC tuning procedures |
| JSOCINT-11 | (DQ) | Yes | | TA for MIRI Imaging (GTO: 10 eclipses of TRAPPIST-1b) |
| JSOCINT-58 | (DQ) | Yes | OSS 8.2 | Allow coronagraphy subarrays in NIRCcam Dark template |
| JSOCINT-158 | (DQ) | No | | Make TA optional for MIRI coronagraphy (AGN science) |
| JSOCINT-224 | (DQ) | Yes | | Enable more resets between MIRI integrations (brighter targets) |

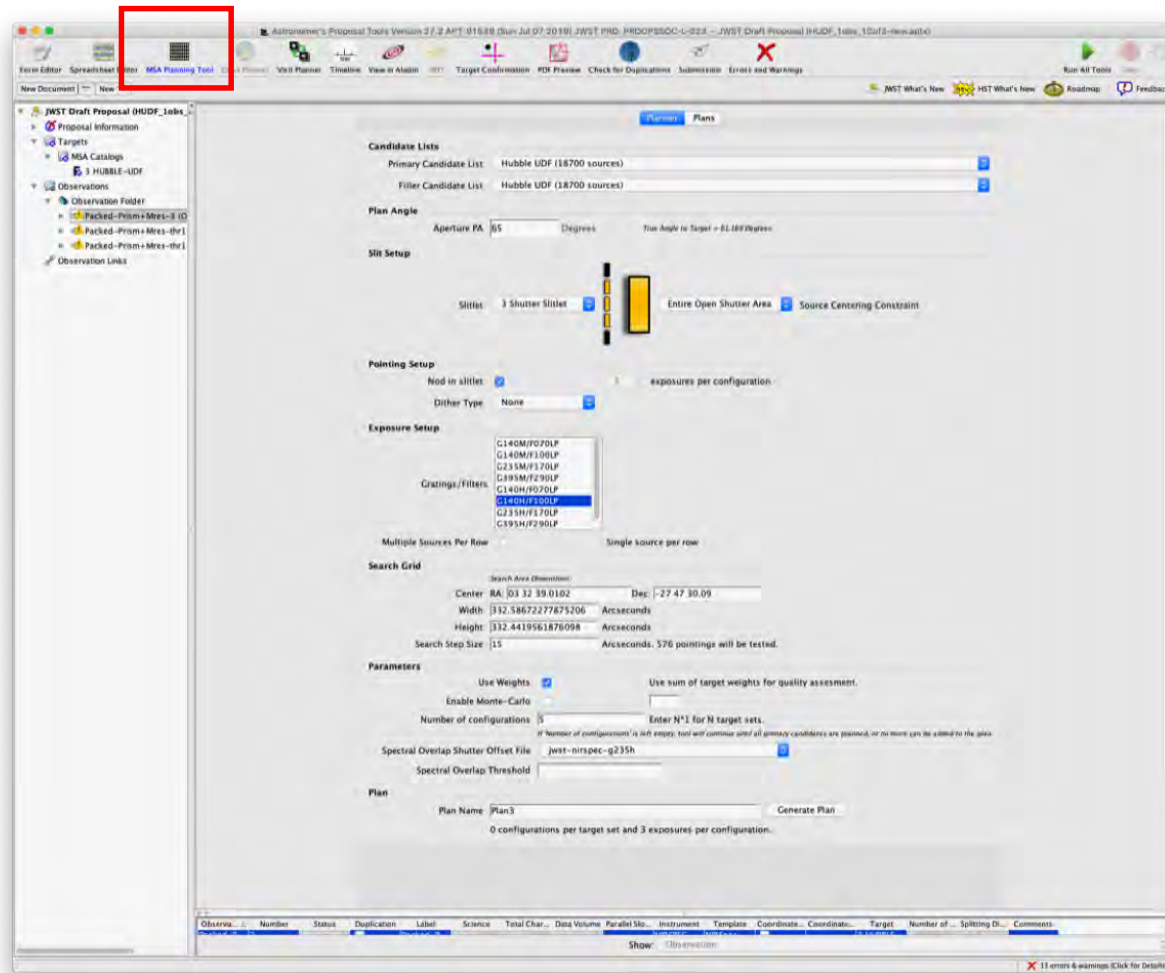


Science enhancements – User tools (UT)

| JIRA Ticket | ID | OSS | Build | Description |
|-------------|--------|-----|-----------------------|--|
| Multiple | UT1 | No | PPS 14.7, JDox | Address GO Cycle 1 feedback (see talk by Klaus Pontoppidan) |
| APT-72607 | UT2 | No | PPS 14.8 | Implement a visit timeline in APT |
| JSOCINT-6 | UT3 | No | PPS 14.9 | Reimplement MSA planning tool (huge effort)  |
| JSOCINT-189 | (UT) | No | ETC 1.5 | ETC support for NIRSpec confirmation/verification images  |



Reimplement MSA planning tool (UT3) – Proper APT tool now





Reimplement MSA planning tool (UT3) – New plans tab

Adrian's Proposal Tools Version 27.2 API-91938 (Sun Jul 07 2019) JWST PID: PRDOPSPROC-1-0223 --JWST Draft Proposal (HJDF_1dhw_110d73-new.astr)

Form Editor | Spreadsheet Editor | MSA Planning Tool | Check Proposal | Visit Planner | Timeline | View in Aladin | Target Confirmation | PDR Preview | Check for Duplicates | Submission | Events and Warnings | Run All Tools | Help

New Document | New

JWST Draft Proposal (HJDF_1dhw_110d73-new.astr)

- Proposal Information
- Targets
- MSA Catalogs
- 3 HUBBLE-UDF
- Observations
- Observation Folder
 - Packed-Prism+Mres-3 (O
 - Packed-Prism+Mres-dbr1
 - Packed-Prism+Mres-dbr1
- Observation Lines

Planner | Plans

Plan Selection

| Plan | # Configs | # Exposures | # Primary Sources | # Secondary Sources | Score |
|-------|-----------|-------------|-------------------|---------------------|-------|
| Plan1 | 5 | 115 | 405 | 0 | 98.2 |
| Plan2 | 5 | 115 | 407 | 0 | 104.8 |
| Plan3 | 5 | 115 | 408 | 0 | 104.0 |

Select multiple plans to review them in combination

Create Observation | Apply Plan(s) | Delete Plan(s) | Describe Plan(s)

Pointings

| # | Name | RA | Dec | RA (HMS) | Dec (DMS) | APK | Grating/Filter | Target | Total | Send to | Export |
|-----|-------|------------|------------|------------|-----------|-----------|----------------|--------|-------|---------|--------|
| 198 | c4e19 | 53.1642703 | -27.777913 | 03 32 39.4 | -27 46 44 | 64.998893 | G235H/F17 | 100 | 5115 | Show | Send |
| 399 | c4e20 | 53.1643714 | -27.779000 | 03 32 39.4 | -27 46 44 | 64.998893 | G235H/F17 | 100 | 5115 | Show | Send |
| 400 | c4e21 | 53.1644210 | -27.779007 | 03 32 39.4 | -27 46 44 | 64.998893 | G395H/F29 | 95 | 4873 | Show | Send |
| 401 | c4e22 | 53.1642703 | -27.777913 | 03 32 39.4 | -27 46 44 | 64.998893 | G395H/F29 | 95 | 4873 | Show | Send |
| 402 | c4e23 | 53.1643714 | -27.779000 | 03 32 39.4 | -27 46 44 | 64.998893 | G395H/F29 | 100 | 5115 | Show | Send |
| 403 | c4e24 | 53.1644210 | -27.779007 | 03 32 39.4 | -27 46 44 | 64.998893 | PRISM/CLEAR | 95 | 4809 | Show | Send |
| 404 | c4e25 | 53.1642703 | -27.777913 | 03 32 39.4 | -27 46 44 | 64.998893 | PRISM/CLEAR | 95 | 4873 | Show | Send |
| 405 | c4e26 | 53.1643714 | -27.779000 | 03 32 39.4 | -27 46 44 | 64.998893 | PRISM/CLEAR | 100 | 5115 | Show | Send |

Targets

Target Set Operation: Targets in at least one selected exposure | Primary targets | Send to Aladin

81 targets are shown.

Targets

| ID | Weight | Exposures | c4e19 | c4e25 |
|------|--------|-----------|-------|-------|
| 647 | 37 | 2 | x | |
| 669 | 6 | 2 | x | |
| 765 | 74 | 2 | x | |
| 819 | 90 | 2 | x | |
| 853 | 69 | 2 | x | |
| 892 | 96 | 2 | x | |
| 932 | 14 | 2 | x | |
| 948 | 72 | 2 | x | |
| 981 | 50 | 2 | x | |
| 1123 | 59 | 2 | x | |
| 1127 | 59 | 2 | x | |
| 1196 | 9 | 2 | x | |
| 1204 | 86 | 2 | x | |
| 1212 | 15 | 2 | x | |
| 1213 | 83 | 2 | x | |
| 1215 | 55 | 2 | x | |
| 1216 | 66 | 2 | x | |
| 1234 | 27 | 2 | x | |
| 1251 | 29 | 2 | x | |

Coverage

Number of Targets

Number of Exposures

Timing

Observation Folder: | Label: | Comments:

Show: Observation Folder

11 errors & warnings (Click for Details)



Reimplement MSA planning tool (UT3) – Catalogs are now targets

3 HUBBLE-UDF of JWST Draft Proposal (HUDF_1obs_1Cof3-new.aptx)

Number: []

Name in the Proposal: HUBBLE-UDF (unique within proposal)

Name for the Archive: [] (standard reusable name)

Category: Clusters... []

Description: +/- Brightest cluster galaxies, Rich clusters
Choose 1 to 5 items after selecting a category.

[Catalog] Candidate Sets Comments

Name: Hubble UDF

Astrometric Accuracy (mas): 10.0

Reference Position: RA: 83.32 38.8779 Dec: -27.47 28.58

Pre-Image Availability: Not required

| ID | RA | DEC | Size | Bandshift | Reference | Stetarity | Bmag | Vmag | zmag | NIR_F110W | NIR_F140X | NIR_CLEAR | Weight |
|------------------|--------------|-----|-------|-----------|-----------|-----------|--------|--------|--------|-----------|-----------|-----------|--------|
| 1.03.32.19.7228 | -27.49.42.53 | 0 | 0.472 | Yes | -1 | 24.1 | 23.318 | 22.68 | 20.68 | 21.68 | 19.68 | 3 | |
| 2.03.32.19.4794 | -27.49.45.42 | 0 | 2.703 | Yes | -1 | 29.704 | 29.26 | 29.118 | 27.318 | 28.118 | 26.118 | 53 | |
| 3.03.32.19.1663 | -27.49.45.20 | 0 | 1.281 | Yes | -1 | 29.599 | 29.789 | 29.726 | 27.726 | 28.726 | 26.726 | 86 | |
| 4.03.32.19.1095 | -27.49.44.90 | 0 | 1.793 | Yes | -1 | 99 | 29.559 | 29.344 | 27.344 | 28.344 | 26.344 | 59 | |
| 5.03.32.19.1686 | -27.49.44.01 | 0 | 0.452 | Yes | -1 | 28.039 | 27.348 | 26.958 | 24.958 | 25.958 | 23.958 | 83 | |
| 6.03.32.19.4281 | -27.49.44.04 | 0 | 2.769 | Yes | -1 | 28.275 | 28.013 | 28.482 | 26.482 | 27.482 | 25.482 | 35 | |
| 7.03.32.19.4510 | -27.49.42.95 | 0 | 1.653 | Yes | -1 | 25.349 | 25.338 | 25.165 | 23.165 | 24.165 | 22.165 | 61 | |
| 8.03.32.19.3398 | -27.49.38.35 | 0 | 0.636 | Yes | -1 | 28.409 | 22.382 | 20.921 | 18.921 | 19.921 | 17.921 | 47 | |
| 9.03.32.19.0994 | -27.49.43.91 | 0 | 0.695 | Yes | -1 | 29.838 | 29.209 | 28.349 | 26.349 | 27.349 | 25.349 | 38 | |
| 10.03.32.19.5233 | -27.49.43.20 | 0 | 1.029 | Yes | -1 | 27.518 | 27.712 | 27.599 | 25.599 | 26.599 | 24.599 | 4 | |
| 11.03.32.19.5231 | -27.49.41.72 | 0 | 4.17 | Yes | -1 | 99 | 31.128 | 30.378 | 28.378 | 29.378 | 27.378 | 50 | |
| 12.03.32.19.8932 | -27.49.42.91 | 0 | 3.113 | Yes | -1 | 29.114 | 28.716 | 28.924 | 26.924 | 27.924 | 25.924 | 76 | |
| 13.03.32.19.3236 | -27.49.39.06 | 0 | 0.491 | Yes | -1 | 26.219 | 25.415 | 24.746 | 22.746 | 23.746 | 21.746 | 40 | |
| 14.03.32.16.4668 | -27.49.31.84 | 0 | 0.613 | Yes | -1 | 28.499 | 23.537 | 22.448 | 20.448 | 21.448 | 19.448 | 4 | |
| 15.03.32.16.8458 | -27.49.39.29 | 0 | 0.619 | Yes | -1 | 28.094 | 26.808 | 25.534 | 23.534 | 24.534 | 22.534 | 87 | |
| 16.03.32.19.4492 | -27.49.40.20 | 0 | 2.074 | Yes | -1 | 28.34 | 28.465 | 28.419 | 26.419 | 27.419 | 25.419 | 73 | |
| 17.03.32.40.0772 | -27.49.40.32 | 0 | 1.438 | Yes | -1 | 31.118 | 29.83 | 30.014 | 28.014 | 29.014 | 27.014 | 79 | |
| 18.03.32.16.6938 | -27.49.39.54 | 0 | 1.77 | Yes | -1 | 28.069 | 28.122 | 28.024 | 26.024 | 27.024 | 25.024 | 13 | |
| 19.03.32.16.9375 | -27.49.37.01 | 0 | 0.496 | Yes | -1 | 26.518 | 24.669 | 23.122 | 22.322 | 23.322 | 20.322 | 85 | |
| 20.03.32.16.2011 | -27.49.39.54 | 0 | 4.95 | Yes | -1 | 99 | 99 | 28.526 | 27.526 | 28.526 | 26.526 | 48 | |

Column for Flux: zmag

Fixed Target: Equatorial

Show: Fixed Target: Equatorial

11 errors & warnings (Click for Details)



Reimplement MSA planning tool (UT3) – Manually editor is simpler

Adrianneer's Proposal Tools Version 27.2 APT-01538 (Sun Jul 07 2019) JWST PRD: PHDOPSDOC-1-023 -- JWST Draft Proposal (HUDF_1obs_1Cof3-new.aptx)

File Editor Spreadsheet Editor MSA Planning Tool Data Preview Visit Planner Timeline View in Aladin JPY Target Confirmation JPY Preview Check for Duplications Submission Errors and Warnings Run All Tools Help

New Document | New

JWST Draft Proposal (HUDF_1obs_1Cof3-new.aptx)

Proposal Information

Targets

MSA Catalogs

3 HUBBLE-UDF

Observations

Observation Folder

Packed-Prism+Mres-3 (0)

Packed-Prism+Mres-3 (1)

Packed-Prism+Mres-3 (2)

Observation Links

Number: 2 Status: UNKNOWN Duplication

Label: Packed-Prism+Mres-3

Instrument: NIRSPEC

Template: NIRSpec MultiObject Spectroscopy

Coordinated Parallel

Target: 3 HUBBLE-UDF

Visit Splitting

Splitting Distance: 80.0 Arcsec

Number of Visits: 1

Science

Duration (secs): 35468

Total Charged: 24363

Data Volume: 8773 MB

NIRSpec MultiObject Spectroscopy Mosaic Properties Special Requirements Comments

Pre-Image Availability: Not required

TA Method: MSATA

Target Acquisition Parameters

Adjust Target Acquisition using the MSA are designed for each inst.

Science Parameters

This observation was created from plan: Packed-Prism+Mres-3

Primary Candidate List: Hubble UDF (18700 sources)

Aperture PA: 50.0 Degrees

Ths Appts to Target = 50.200 Degrees

Science Aperture: MSA Center

| # | Grating/Filter | Readout Pattern | Groups/Int | Integrations/Exp | Autocal | ETC MSA-Cell ID | ETC |
|---|----------------|-----------------|------------|------------------|---------|-----------------|-----|
| 1 | PRISM/CLEAR | NRS | 30 | 1 | NONE | | |
| 2 | G140M/F100LP | NRS | 30 | 1 | NONE | | |
| 3 | G235M/F170LP | NRS | 30 | 1 | NONE | | |
| 4 | G393M/F290LP | NRS | 30 | 1 | NONE | | |

Add Duplicate Insert Above Remove

Spectral Overlap Map: None Selected

Spectral Overlap Threshold:

| # | Grating/Filter | MSA Configuration | Read Pattern | Positioning | Dispersion Offset | Cross-Dispersion Off. | Total Dithers | Total Integrations | Total Exposure Time |
|---|----------------|-------------------|-----------------|----------------|-------------------|-----------------------|---------------|--------------------|---------------------|
| 1 | PRISM/CLEAR | Configuration: c0 | 3 Shutter Sides | 03 32 19 63340 | ... | 3 | 1 | 3597.448 | |
| 2 | G140M/F100LP | Configuration: c0 | 3 Shutter Sides | 03 32 19 63340 | ... | 3 | 1 | 3597.448 | |
| 3 | G235M/F170LP | Configuration: c0 | 3 Shutter Sides | 03 32 19 63340 | ... | 3 | 1 | 3597.448 | |
| 4 | G393M/F290LP | Configuration: c0 | 3 Shutter Sides | 03 32 19 63340 | ... | 3 | 1 | 3597.448 | |

Add Duplicate Insert Above Remove

Configurations/Pointings

Confirmation Images

Obtain Confirmation Images: No

Edit Observation Folder New Edit Visit 2 1

| Observ... | Number | Status | Duplication | Label | Science | Total Char... | Data Volume | Parallel Mo... | Instrument | Template | Coordinate... | Coordinate... | Target | Number of ... | Splitting Di... | Comments |
|------------------|--------|--------|-------------|-------|---------|---------------|-------------|----------------|------------|----------|---------------|---------------|--------|---------------|-----------------|----------|
| Show Observation | | | | | | | | | | | | | | | | |

11 errors & warnings (Click for Details)



Add ETC support for NIRSpec confirmation/verification images (UT)

Calculations Scenes and Sources Upload Spectra Caveats and Limitations

MIRI NIRCam NIRISS NIRSpec ?

| ID | Mode | λ | |
|----|---|-----------|---------------------------|
| 4 | <input checked="" type="checkbox"/> nirspec ifu_ver | 1.13 | Multi-Object Spectroscopy |
| 3 | <input type="checkbox"/> nirspec mos_ver | 1.14 | Fixed Slit/BOTS |
| 2 | <input type="checkbox"/> nirspec mos_conf | 1.34 | IFU |
| - | - | - | Target Acquisition |
| - | - | - | MOS Confirmation Imaging |
| - | - | - | MOS Verification Imaging |
| - | - | - | IFU Verification Imaging |

Scene Backgrounds Instrument Setup Detector Setup Strategy

Subarray: FULL Readout pattern: NRS

Groups per integration: 10 Integrations: 1 Exposures: 1

Total exposure time: 00:07:20 (440.21 s)

Total integrations: 1

Calculation selected: 4, Mode: nirspec ifu_ver

Reset Calculate



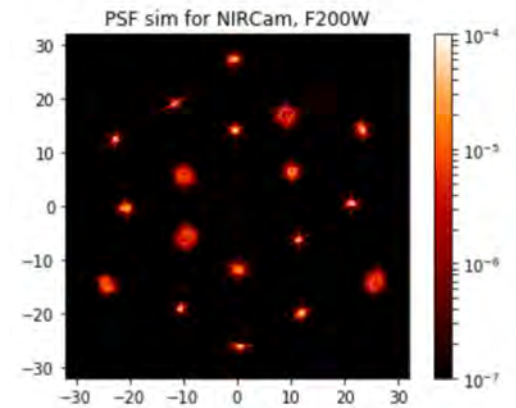
Science enhancements – New science capability (SC)

| JIRA Ticket | ID | OSS | Build | Description |
|-------------|--------|-----|----------------|---|
| | SC1 | Yes | | Enable target locate for saturated stars |
| JSOCINT-264 | SC2 | Yes | OSS 8.2? | Enable DHS use in NIRCcam Grism Time Series |
| JSOCINT-113 | (SC) | Yes | OSS 8.2? | Add filter options to NIRCcam TA (brighter targets) |
| JSOCINT-104 | (SC) | Yes | OSS 8.1 | Allow FASTGOUPAVG=8/16/32/64 in MIRI TA (relatively easy) |
| JSOCINT-189 | (SC) | No | PPS 14.9 | Allow multiple exposures in NIRSspec BOTS |



Science enhancements – S&OC enhancement (SE)

| JIRA Ticket | ID | OSS | Build | Description |
|---------------|-----|-----|----------------------|--|
| Tracking page | SE1 | No | Ongoing | Generate simulated data |
| | SE2 | No | WebbPSF 0.8.1 | Enhance model of wavefront error (commissioning scenarios) |





Fix bugs in implemented capabilities and address liens

| JIRA Ticket | ID | OSS | Build | Description |
|---|---------|-----|---------|---|
| JSOCINT-146 | (bug) | Yes | OSS 8.1 | Improve robustness of NIRSpec TA (NRSRAPIDD6 pattern) ⓘ |
| JWSTOSS-6537 | (bug) | Yes | OSS 8.1 | Use bad pixel mask during MIRI TA |
| JWSTOSS-6810 | (bug) | Yes | OSS 8.1 | Allow dithering for MIRI external flats |
| Dozens more relevant to commissioning, S&OC architecture, requirements verification, etc. | | | | |



Improve robustness of NIRSpec target acquisition

- Cosmic ray mitigation during NIRSpec target acquisition
 - Find centroid in image cutout: $\text{Min}(\text{Group2} - \text{Group1}, \text{Group3} - \text{Group2})$
- NIRSpec target acquisition uses two detector readout patterns
 - NRSRAPID – each group consists of one frame
 - NRS – each group is the average of four frames
- Problem occurs when cosmic ray occurs in the middle of a group
 - $G1: [0, 0, 0, 0] \rightarrow 0$; $G2: [0, 0, 10k, 10k] \rightarrow 5k$; $G3: [10k, 10k, 10k, 10k] \rightarrow 10k$
 - $\text{Min}(G2 - G1, G3 - G2) = 5k$ due to cosmic ray, not the target
 - Predicted to impact 23% of NRS centroids in a full-frame MSA target acquisition
- Solution is to ignore (drop) most frames in a group: NRSRAPIDD6
 - $G1: [0, x, x, x, x, x] \rightarrow 0$; $G2: [0, x, x, x, x, x] \rightarrow 0$; $G3: [10k] \rightarrow 10k$
 - $\text{Min}(G2 - G1, G3 - G2) = 0$ mitigating the cosmic ray



Priorities for JWST work by Instrument Division over next 6 months

- Now through Cycle 1 General Observer Call for Proposals on 2020 Jan 23
- Instruments Division staff (astronomers, scientists, analysts)

| Priority | Task |
|----------|--|
| 1 | Prepare curriculum for and support Master Class (see presentation by Bonnie Meinke) |
| 2 | Support rehearsals in the Mission Operations Center using the Observatory Test Bed simulator |
| 3 | Support update of the APT timing model ⓘ |
| 4 | Evaluate DMS 7.3 calibration pipeline and report any bugs |
| 5 | Support data analysis tools development (product owners, developers, validation) |
| 6 | Improve robustness of INS developed user tools (e.g., visibility tool) |
| 7 | Support NIRSpec MSA Planning Tool rewrite/release |
| 8 | Make any remaining changes to science instrument aperture file needed for launch |
| 9 | Begin submitting APT files for Cycle 1 calibration programs |



More priorities for JWST work by Instrument Division

| Priority | Task |
|----------|---|
| 10 | Provide science inputs for science enhancements listed in the launch delay letter |
| 11 | Provide science inputs for important pipeline enhancements |
| 12 | Generate simulated data for pipeline/tools testing (also: release MIRAGE simulator) |
| 13 | Support Exposure Time Calculator (ETC) development |
| 14 | Update JDox and videos for Cycle 1 Call for Proposals (beyond Master Class, timing model, etc.) |
| 15 | Support MIRI detector tests at JPL |
| 16 | Promptly answer Help Desk questions (volume should be low) |
| 17 | Develop pipeline validation tests and report issues (particularly for associations) |
| 18 | Maintain calibration pipeline reference files. Updates needed by DMS are higher priority |
| 19 | Continue developing commissioning analysis plans, code, and simulated data |
| 20 | Develop initial set of monitors for science performance trending tool (JWQL) |



APT timing model

- Overheads currently in APT are based on ground tests with OSS 5
- JWST software (S&OC, OSS, flight software) has evolved since then
- Observatory Test Bed (OTB) runs latest OSS and flight software
 - Has some flight-like hardware (e.g., ISIM computer)
 - Simulates instruments (including detector electronics) in software
- S&OC is using OTB telemetry to update APT timing model
 - Development branch available for internal testing by end of September
 - Public release in mid-December (PPS 14.9) before GO Call for Proposals
 - Release minor updates in March (PPS 14.10) before proposal deadline



Changes will be to overhead duration

Charged duration =

Slew duration +

Scheduling duration +

Direct scheduling overhead +

Indirect overhead

Scheduling duration =

Science duration +

Overhead duration

Overhead duration =

Initial overheads +

Visit start overheads +

Between overheads +

SAM times +

Mechanism move times +

Exposure overheads +

SI specific overheads +

Visit cleanup



Examples of changes to overhead duration

- Reduce OSS compile times
- Reduce detector setup overheads for some exposures
- Add time to drop guiding before a small angle maneuver
- Add time (~ 24 s) to manage logical structures in a visit file
- Update time required to handle a failed guide star acquisition
- Update time to slew between FGS ID and science attitude
- Update time to process an end of visit (mode dependent)
- Model target acquisitions in more detail (mode dependent)
- Model NIRCам subarray configuration in more detail
- Model new observing strategies (e.g., dither during NIRISS WFSS)



Will visit overheads increase or decrease?

- We don't know yet
 - Many low-level changes to the timing model
 - Need the APT implementation to assess the global impact
- Impact will be mode dependent
- Plan to run GTO/ERS programs and analyze any large changes