

STScI | SPACE TELESCOPE SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

JWST Cycle 5 Observatory Briefing

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JWST continues to exceed expectations

- Telescope
  - Wavefront error is ~67 nm after routine corrections (requirement was 130 nm)
  - Diffraction limited down to 1.1 µm (requirement was down to 2 µm)
- Guider
  - Guiding success rate continues to improve (~98%), especially in crowded fields
  - Aperture locations in the focal plane have been measured more precisely
- Instruments
  - All instruments continue to perform very well
  - MIRI MRS 4C and Imager 25 µm count rate loss is slowing (e.g., Figure 5 in JDox)
- Calibration
  - Many enhancements to the quality of data products. More work to be done

New capabilities for Cycle 5

- NIRISS SOSS "multistripe" (detector mode)
  - Increases bright limit from J ~ 8.4 mag to J ~ 3.5 mag (Table 1 in JDox)
  - Interleaves integrations of different sections of the spectrum (Figure 2 in JDox)
- MIRI WFSS
  - 5 – 14 µm spectra at R ~ 100 over 1.2' x 1.9' FOV
  - First new template in APT since launch (See Figure 1 in JDox)
- NIRSpec IFU Spectroscopy + NIRCam Imaging coordinated parallels
- Moving target "shadow" observations
  - Observe smeared background sources without the foreground moving target
- New MIRI subarray sizes to mitigate 390 Hz EMI noise
- New NIRCam dithers for NIRSpec MSA pre-imaging

NIRCam Grism Time Series with short wavelength (DHS) spectra

- The new NIRCam DHS capability was introduced in Cycle 4
  - First application of the new "multistripe" detector capability
  - DHS is used by two approved Cycle 4 programs
  - Those two programs will execute, but they will start later than planned
- Unexpected detector behavior during first test observation
  - Root cause of the behavior is fully understood and is specific to NIRCam
  - The fix was a simple software change, which has been implemented
  - Testing on the ground is complete, a flight test is imminent
- NIRCam DHS will be working by the start of Cycle 5

New tool to explore pure parallel observing scenarios

- The `jwpure` software package facilitates statistical analysis of JWST pure parallel observing scenarios, based on historical data from previous observing cycles. Proposers do not have to use this software.
- The information and links below may help reviewers understand any jwpure results that appear in proposals.
- The package supports planning and evaluation of future pure parallel programs by quantifying the availability of past observing opportunities under specific constraints needed for a future program.
  - Example constraints: prime instrument, number of required instrument configurations, exposure time, number of dithers, position in the sky
- Documentation on the github wiki describes the algorithm (which is not trivial) and the resulting summary table.

Check that special requirements are scientifically justified

- Timing constraints make scheduling harder for the constrained program and others
  - Explicit timing constraints (e.g., period and phase)
  - Roll angle constraints, which are implicit timing constraints
  - Coordination with other observatories
- Disruptive targets of opportunity are disruptive
  - Operations staff have to build and uplink a new short-term schedule
  - Other observers discover very late that their observations will be delayed
- Coordinated parallels use observatory resources
  - Mechanism usage
  - Recorder space and especially downlink bandwidth
  - Parallel slots can also used by pure parallel programs

Considerations when evaluating pure parallel programs

- 8 pure parallel programs approved in cycles 1-3 (3000 hours, 200 visits)
  - No pure parallel programs were approved in Cycle 4
- Pure parallel programs are not free
  - Mechanism usage (small fraction of lifetime)
  - Observatory overhead (131 prime hours so far)
  - Downlink bandwidth (5 TB so far)
  - Grants (2% in cycle 1-3)
  - Scheduling (but we will now limit data excess after attachment to less than 5 GB)
  - User support (156 APT submissions for 8 programs)
  - See presentation to the JSTUC for more details
- If the science is compelling, the capability is available

Considerations when evaluating GO calibration proposals

- 18 GO calibration programs approved in cycles 1-4
  - 13 observing programs
    - 6 measured observatory behavior (e.g., PSF, fringes, wavelengths, charge migration)
    - 3 tested a new observing mode or strategy (e.g., MRS TSO, hexagonal dithers for coronagraphy)
    - 2 calibrated data ignored by the pipeline (SOSS order 3, NIRCam WFSS order 2)
    - 2 demonstrated a new data analysis techniques (kernel phase imaging, phase retrieval)
  - 5 archival programs
    - 4 measured observatory behavior (e.g., NIRCam wisps, MSA flux calibration, MIRI imaging PSF)
    - 1 measured observatory environment (e.g., Zodiacal and extragalactic background)
- GO calibration programs are not free
  - Some use prime observing time (149 hours, drawn from pool of available hours)
  - Some require STScI software development (delays other new capabilities)
  - All use grant funding
- If the idea is compelling, the opportunity is available

Final thoughts

- Please ask if technical aspects of a proposal are unclear. Otherwise, assume proposals are feasible.
- STScI will review accepted programs and recommend revisions, if appropriate. Proposals do not have to be technically perfect.
- Thank you for contributing to the success of JWST!