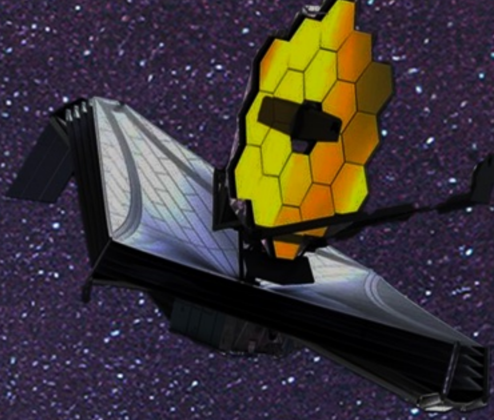


JWST/ALMA JOINT PROPOSAL WORKSHOP

THURSDAY, 5TH AND FRIDAY 6TH DECEMBER 2024

Compiled by Thiebaut Schirmer (with contributions from Karl Gordon and the ALMA Nordic Node)

Contents

Information

Introduction

We are glad to invite you to the two-day JWST/ALMA Synergy Workshop, an event designed to explore the exceptional opportunities available at the intersection of these two groundbreaking observatories. The workshop will provide a unique platform to enhance our understanding of how the complementary capabilities of the James Webb Space Telescope (JWST) and the Atacama Large Millimeter/submillimeter Array (ALMA) can be leveraged to address some of the most interesting questions in astrophysics.

This event is made possible thanks to the generous funding provided by the AoP division. We extend our gratitude to Karl Gordon (STScI) for his expertise and invaluable contributions to the JWST-focused components of the workshop. On the ALMA side, we are privileged to have the guidance and knowledge of the Nordic ALMA Node, represented by Sabine König, Sebastien Muller, Daniel Tafoya, and Carmen Toribio.

Throughout the workshop, participants will engage in a variety of sessions tailored to foster both practical skills and collaborative potential. These include detailed background presentations, hands-on exercises in proposal writing and data processing, and focused discussions aimed at developing successful joint proposals. Whether you are a seasoned user of JWST or ALMA or new to these observatories, the workshop will provide valuable insights and tools to advance your research.

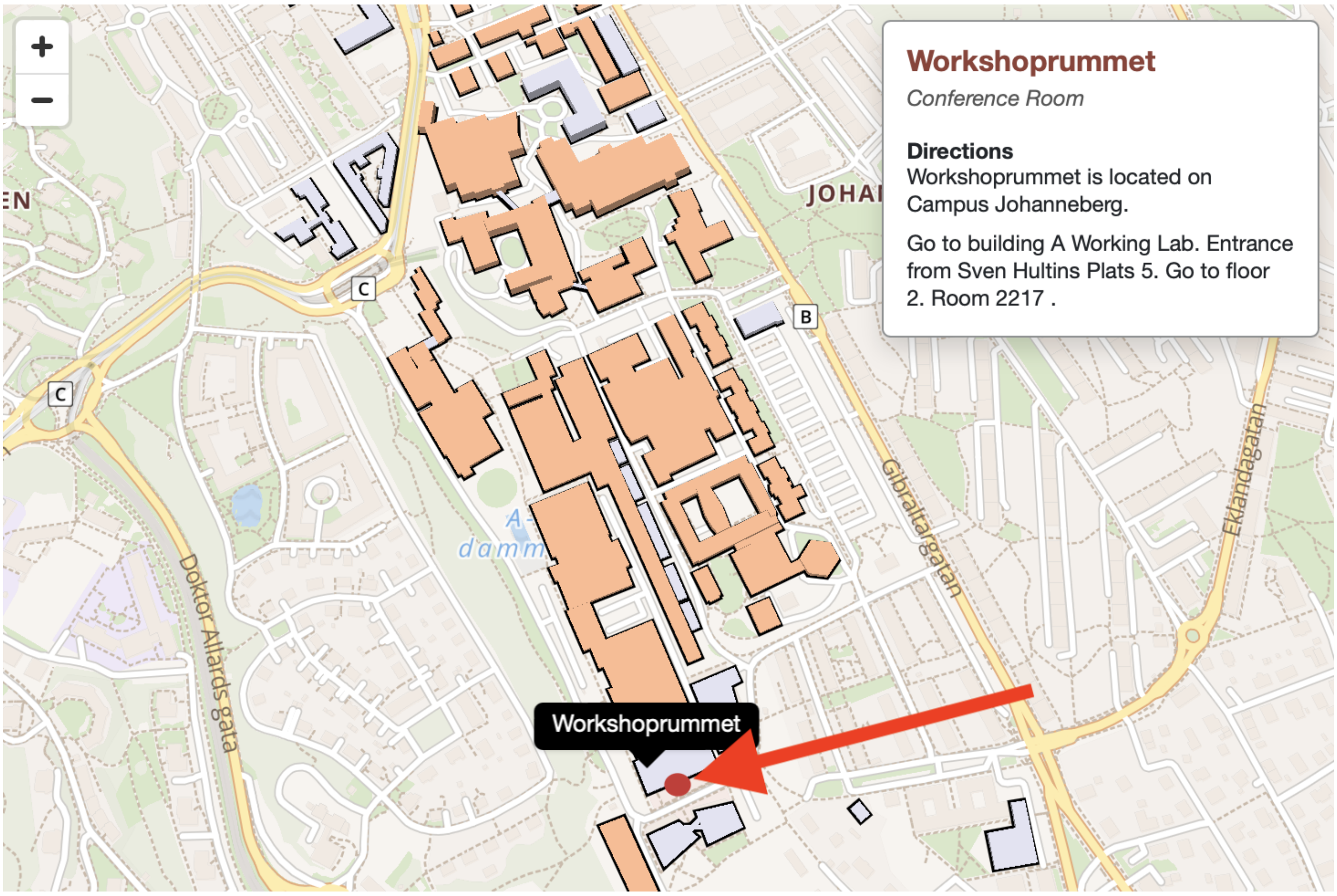
We look forward to vibrant discussions, fruitful collaborations, and the exchange of ideas that will drive forward the frontiers of astrophysical research. Thank you for joining us in this exciting exploration of JWST-ALMA synergy!

Thiebaut Schirmer on behalf the LOC

This document has been compiled by Thiebaut Schirmer (with contributions from Karl Gordon and the ALMA Nordic Node). If you have any questions, please contact Thiebaut at thisch@chalmers.se.

How to get to the workshop

Date: December 5-6, 2024 Location: Workshoprummet (Workshoprummet is located on Campus Johanneberg. Go to building A Working Lab. Entrance from Sven Hultins Plats 5. Go to floor 2. Room 2217 - it is the same building as restaurant 'Waste')



Fika, Lunches, and Workshop Dinner

The workshop includes:

- Morning breaks (coffee, tea, rolls with fresh bread, vegetables and cheese[1]).
- Afternoon breaks (coffee, tea, pastries of the day).
- Lunches at the restaurant 'Waste', located in the same building.

The workshop dinner is scheduled for Thursday, December 5th, at 6 PM at Majornas Bryggeri or Poppels Bryggeri (to be confirmed by the beginning of the workshop) for participants who have confirmed their attendance.

If you wish to join but haven't reached out yet, please contact us as soon as possible, and we will check if additional arrangements can be made. Please note that the dinner is at your own expense.

[1]alternatives will be proposed for those who registered special allergies and/or diets

Pre-Workshop Preparations

Participants are encouraged to complete the following tasks before attending the workshop to ensure they are fully prepared for the hands-on sessions.

Preparations for JWST Sessions

1. **Create a myST account.**
   Register for a myST account by visiting the following link: https://proper.stsci.edu/proper/authentication/auth

2. **Install the Astronomer's Proposal Tool (APT).**
   Download and install APT from the official JWST documentation website: https://jwst-docs.stsci.edu/jwst-astronomers-proposal-tool-overview#gsc.tab=0

3. **Familiarize yourself with the JWST Exposure Time Calculator (ETC).**
   Explore and practice using the JWST ETC through this link: https://jwst-docs.stsci.edu/jwst-exposure-time-calculator-overview#gsc.tab=0

4. **Prepare for data reduction sessions (optional but encouraged).**
   Participants can optionally install the JWST pipeline and explore demonstration notebooks to familiarize themselves with data reduction workflows:

   - **JWST pipeline installation:** https://github.com/spacetelescope/jwst (scroll down for instructions).
   - **Demo notebooks:** https://github.com/spacetelescope/jwst-pipeline-notebooks

Preparations for ALMA Sessions

1. **Create an ALMA account.**
   If you do not already have an ALMA account, you are encouraged to create one at the following link: https://almascience.esc

2. **Install the ALMA Observing Tool (OT).**
   Download and install the ALMA Observing Tool to prepare for proposal work and observational planning: https://almascience.eso.org/proposing/observing-tool

Code of conduct

All participants and organisers of the meeting must uphold the Code of Conduct. The workshop is a welcoming and inclusive environment that will allow free expression and the exchange of scientific results.

We firmly reject any kind of abusive behaviour and will not tolerate any kind of harassment towards any workshop participants. All attendees are expected to behave professionally and treat each other with respect for the duration of the meeting and in all activities related to it. We ask all participants to be mindful of the cultural differences between participants. Any discriminatory behaviour against colleagues on any basis such as gender, gender identity, race, ethnic background, national origin, religion, political affiliation, age, maritial status, sexual orientation, physical appearance, body size, disabilities or any other reason will not be tolerated. Any personal attacks, or harassment of a violent or sexual nature will not be tolerated. This applies during the conference as well as during any events and activities related to it, or on any online platform associated with the conference. We ask and encourage all participants to engage in healthy and respectful discussion, with a free exchange of ideas and scientific results. Ideas and results must be respectfully discussed, based solely on their scientific merit.

If there is a breach in the Code of Conduct, we would encourage participants to feel safe and secure in reporting this to any member of the organizing committee for the workshop either in person or via their email

Organising committee and participants

Organising Committee

Karl Gordon - Space Telescope Science Institute (STScI), USA
Sabine König - Onsala Space Observatory, Sweden
Matthias Maercker - Chalmers University of Technology, Sweden
Sebastien Muller - Onsala Space Observatory, Sweden
Thiebaut Schirmer - Chalmers University of Technology, Sweden
Daniel Tafoya - Onsala Space Observatory, Sweden
Carmen Toribio Perez - Onsala Space Observatory, Sweden

Participants

Behzad Bojnordiarbab
Brandt Gaches
Carmen Toribio
Carl Tadeus
Clare Wethers
Daniel Tafoya
Eva Wirstrom
Gustav Olander
John Black
Karl Gordon
Kirsten Knudsen
Kirsty Butler
Mamiko Sato
Mark Siebert
Matthias Maercker
Miora Andriantsaralaza
Mohammad Javad Shahhoseini
Niu Líu
Ramlal Unnikrishnan
Sabine König
Sebastien Muller
Siddharth Kumar
Thiebaut Schirmer
Theo Khouri
Vincente Salinas Froemel
Wouter Vlemmings

Timetable

T: Talk, HO: Hands-on session.

Thursday, 5th December, 2024

JWST Focus			
8:45am–9am	**Coffee**		
9am–9:15am	T	**Matthias Maercker & Thiebaut Schirmer** Chalmers	Welcome and workshop overview
9:15am–10am	T	**Karl Gordon** STScI	Introduction to JWST - Capabilities and science
10am–10:30am	**Coffee break**		
10:30am–11:45am	HO	**Karl Gordon** STScI	Hands-on Session: Preparing a JWST Proposal (Part 1)
11:45am–1pm	**Lunch at the restaurant 'Waste'**		
1pm–2:45pm	HO	**Karl Gordon** STScI	Hands-on Session: Preparing a JWST Proposal (Part 2)
2:45pm–3pm	T	**Karl Gordon** STScI	Open Discussion on JWST Proposals
3pm–3:30pm	**Coffee break**		
3:30pm–4:45pm	HO	**Karl Gordon** STScI	Hands-on Session: JWST Data Processing
4:45pm–5:00pm	T	**Karl Gordon** STScI	Wrap-up and Open Discussion
6pm–9pm	**Workshop dinner at Majornas brew-pub**		

Friday, 6th December, 2024

ALMA Focus			
8:45am–9am	**Coffee**		
9am–10am	T	**Sebastien Muller** Onsala Space Observatory	Introduction to interferometry/ALMA and the ALMA archive
10am–10:30am	**Coffee break**		
10:30am–11:45am	T	**Sabine König & Daniel Tafoya** Onsala Space Observatory	Preparing an ALMA Proposal
11:45am–1pm	**Lunch at the restaurant 'Waste'**		
JWST/ALMA Focus			
1pm–1:20pm	T	**Thiebaut Schirmer** Chalmers	Presentation of the accepted JWST-ALMA joint proposals
1:20pm–3pm	T	**Karl, Sebastien, Daniel, Sabine** STScI & OSO	Questions & answers
3pm–3:30pm	**Coffee break**		
3:30pm–4:55pm	HO	**Karl, Sebastien, Daniel, Sabine** STScI & OSO	Hands-on Session: focus on JWST, ALMA, JWST/ALMA (more details below)

4:55pm–5:00pm	T	**Thiebaut Schirmer** Chalmers	Conclusion

Details about the different sessions

This section will be expanded during the workshop and subsequently used as a reference guide.

Day 1: December 5 – JWST Focus

09:00 – 09:15 *Welcome & Workshop Overview*

- Goals and structure of the workshop
- Synergies between JWST and ALMA

09:15 – 10:00 *Introduction to JWST: Capabilities and Science*

- Overview of JWST instruments and capabilities
- Proposal preparation process for JWST

10:00 – 10:30 *Coffee Break*

10:30 – 11:45 *Hands-on Session: Preparing a JWST Proposal (Part 1)*

- How to structure a proposal for JWST
- Tools and resources for proposal submission
- Key considerations for successful proposals

11:45 – 13:00 *Lunch Break*

13:00 – 14:30 *Hands-on Session: Preparing a JWST Proposal (Part 2)*

- Continuation of proposal preparation exercise

14:30 – 15:00 *Open Discussion on JWST Proposals*

- Time for questions and group feedback on the proposal process
- Participants can show to each other what they have done

15:00 – 15:30 *Coffee Break*

15:30 – 16:45 *Hands-on Session: JWST Data Processing*

- Walkthrough of JWST data processing techniques
- Practical exercises with real JWST datasets

16:45 – 17:00 *Day 1 Wrap-up and Open Discussion*

- Review of Day 1 activities

- Feedback from participants
- Open discussion on JWST-related questions

Day 2: December 6 – ALMA Focus and Synergies

09:00 – 10:00 *Introduction to Interferometry/ALMA and the ALMA Archive (Sebastien)*

- Short introduction on interferometry
- The ALMA archive (and the participants will do an exercise/interactive demo)

10:00 – 10:30 *Coffee Break*

10:30 – 11:45 *Preparing an ALMA Proposal (Daniel, Sabine)*

- Key considerations for proposal preparation
- Joint proposals with other observatories

11:45 – 13:00 *Lunch Break*

13:00 – 13:20 *Present different JWST/ALMA joint proposals that have been accepted*

13:20 – 15:00 *Answer the Questions*

- Answer questions sent before the workshop
- Answer questions asked during the workshop if time permits

15:00 – 15:30 *Coffee Break*

15:30 – 16:30 *Free Hands-on Session*

- Continuation of proposal preparation exercise
- Participants are free to focus on a JWST-ALMA joint proposal, ALMA proposal, JWST proposal, JWST or ALMA data processing
- Experts (Karl, Sebastien, Daniel, and Sabine) will be available for help

16:55 – 17:00 *Conclusion*

- Summary of key learnings
- Next steps for participants
- Open discussion on possible future workshops

Questions asked

#	Category	Question
1	ALMA	What configurations of ALMA arrays work best for proposals involving JWST data?
2	ALMA	What are some common pitfalls when defining the technical feasibility for ALMA observations?
3	ALMA	What are the main differences between ALMA's 12-m array and the ACA (7-m array)?
4	ALMA	How many spectral windows can be included in a single ALMA observing setup?
5	ALMA	What are the weather conditions (e.g., precipitable water vapor) needed for ALMA high-frequency observations?
6	ALMA	What is the smallest angular resolution achievable with ALMA at Band 7?
7	ALMA	How long does it typically take for ALMA observations to be scheduled after approval?
8	JWST	What is the maximum number of filters that can be included in a single JWST observation?
9	JWST	How can I estimate the number of field stars available as background sources for NIRSpec multi-object spectroscopy towards a dark cloud?
10	JWST	How does JWST's sensitivity in the mid-infrared compare to ground-based telescopes?
11	JWST	What are the typical overheads for JWST observations, and how should they be accounted for in proposals?
12	JWST	How can the JWST APT tool's "Coordinated Observations" section be optimized for including detailed ALMA observation requests?
13	JWST	How should one handle observing constraints (e.g., bright object limits, field of view) for JWST when planning overlapping observations with ALMA?
14	JWST/ALMA	Are there examples of successful joint proposals, and what made them stand out?
15	JWST/ALMA	How do JWST and ALMA datasets complement each other in studies of planet formation, galaxy evolution, or stellar environments?
16	JWST/ALMA	What are the key points to include in the scientific justification when combining infrared and millimeter/sub-millimeter data?
17	JWST/ALMA	How should researchers plan observations for proposals requiring simultaneous or near-simultaneous JWST and ALMA data?
18	JWST/ALMA	How do you decide which observatory to submit the proposal to when observing times are similar?
19	JWST/ALMA	How should spatial resolution differences between JWST and ALMA be handled in proposals?
20	JWST/ALMA	How can observing time for JWST and ALMA be balanced to optimize scheduling and scientific return for joint proposals?

21	JWST/ALMA	How does the JWST TAC evaluate joint proposals, and what specific aspects of ALMA's technical feasibility are typically scrutinized?

ALMA

1. **Question**: What configurations of ALMA arrays work best for proposals involving JWST data?

   Answer: Any configuration that enables the achievement of the science goals. Note, however, that ALMA configurations are scheduled according to a predefined calendar: ALMA observing configuration schedule. Thus, simultaneous ALMA observations with specific configurations, such as those with long baselines, may be subject to observatory time constraints.

2. **Question**: What are some common pitfalls when defining the technical feasibility for ALMA observations?

   Answer: ALMA observations need to be prepared within the ALMA Observing Tool. If the tool validates a proposal setup, it indicates that the observations are generally feasible. However, additional caution is advised for demanding observations. It is a good practice to verify the source's transit time against monthly-averaged weather conditions. Particularly, January-February present poor observing conditions, especially for high-frequency observations.

3. **Question**: What are the main differences between ALMA's 12-m array and the ACA (7-m array)?

   Answer: The ACA is a complementary array to the main 12m-antenna array, designed to fill in short spacings and improve image quality on extended sources. The ACA, however, is also available as a standalone instrument (albeit with less sensitivity and lower angular resolution than the 12m-array).

4. **Question**: How many spectral windows can be included in a single ALMA observing setup?

   Answer: Up to four spectral windows can be set (covering up to 8GHz instantaneous bandwidth). Up to four sub-bands (e.g., with high spectral resolution) can be set in each spectral window. It is always advised to set up some wide-band windows for calibration purposes.

5. **Question**: What are the weather conditions (e.g., precipitable water vapor) needed for ALMA high-frequency observations?

   Answer: According to the ALMA Proposer's Guide, the precipitable water vapor at the ALMA site limit is 0.5mm for Band 9 and 10 (see Fig.2 in the guide). Unfortunately, these conditions are not very frequent, typically occurring for only about 10

6. **Question**: What is the smallest angular resolution achievable with ALMA at Band 7?

   Answer: According to Table 7.1 in the ALMA Cycle 11 Technical Handbook, the angular resolution in Band 7 (at 345GHz) is 0.012" in the most extended ALMA 12m array configuration C43-10. The angular resolution could be even higher in Band 7 if one observes at frequencies higher than 345GHz in the most extended configuration.

7. **Question**: How long does it typically take for ALMA observations to be scheduled after approval?

Answer: ALMA observations take place between October 1 and September 30 the following year. However, when an ALMA proposal is observed depends strongly on the visibility of the target source, the scheduling of the requested configuration(s), the observing frequency, the weather conditions, and the grade the proposal received (A – highest priority, B – high priority, C – filler time).

JWST

1. **Question**: What is the maximum number of filters that can be included in a single JWST observation?

   Answer: There is no strict upper limit on the number of filters for a single JWST observation, but practical constraints like overhead times, data volume, and scheduling windows will limit how many can be used efficiently. Each filter change involves overhead, so in practice, most programs use only a handful of filters to keep the observation time manageable.

2. **Question**: How can I estimate the number of field stars available as background sources for NIRSpec multi-object spectroscopy towards a dark cloud?

   Answer: One approach is to use star-count maps (e.g., from existing surveys like Gaia or 2MASS) to approximate the density of stars in your target region. By comparing the cloud's extinction properties and referencing the background star counts from these catalogs, you can estimate how many stars may be bright enough (and not too extincted) for NIRSpec's Multi-Object Spectroscopy (MOS) capabilities. Additionally, the JWST ETC (Exposure Time Calculator) can be used to predict detection limits and refine which sources are truly viable.

3. **Question**: How does JWST's sensitivity in the mid-infrared compare to ground-based telescopes?

   Answer: JWST generally achieves far higher sensitivity in the mid-infrared because it operates above Earth's atmosphere, avoiding atmospheric absorption and thermal background. Ground-based telescopes must contend with both atmospheric emission and absorption, which significantly reduces sensitivity at mid-infrared wavelengths. As a result, JWST can detect much fainter sources and achieve higher signal-to-noise in a given exposure time.

4. **Question**: What are the typical overheads for JWST observations, and how should they be accounted for in proposals?

   Answer: JWST overheads include filter changes, detector readout, target acquisition, and telescope slewing. These overheads can vary depending on the instrument mode and the complexity of the observation, but the JWST Astronomer's Proposal Tool (APT) automatically calculates them. Proposers should rely on APT to estimate total time, ensuring their requested time budget accounts for both science exposures and overhead.

5. **Question**: How can the JWST APT tool's "Coordinated Observations" section be optimized for including detailed ALMA observation requests?

   Answer: The "Coordinated Observations" section is intended to document external scheduling constraints. When planning joint JWST-ALMA observations, you can specify the desired timing or scheduling window for ALMA in this section. Although the JWST team does not directly coordinate ALMA's schedule, having these details helps the JWST schedulers understand any strict timing requirements and can assist if rescheduling is needed.

6. **Question**: How should one handle observing constraints (e.g., bright object limits, field of view) for JWST when planning overlapping observations with ALMA?

   Answer: Proposers should check the JWST documentation for bright object limits—especially for instruments like MIRI. For field of view constraints, note that JWST's instruments each have slightly different fields of view (e.g., NIRSpec vs. NIRCam). When overlapping with ALMA, ensure that the region of interest is covered in both sets of observations. You may need to plan for dithers or multiple pointings if the target or science field is extended. Be clear in your proposal how these constraints are addressed and justified.

JWST-ALMA

1. **Question**: Are there examples of successful joint proposals, and what made them stand out?

   Answer: Examples of successful joint projects can be searched in the ALMA archive by clicking the "Joint" column search and specifying "JWST". You can find these proposals at the end of this document.

2. **Question**: How do JWST and ALMA datasets complement each other in studies of planet formation, galaxy evolution, or stellar environments?

   Answer: ALMA primarily traces the cold dust component, while JWST traces the warm dust. ALMA also provides much higher velocity resolution, making it useful for kinematics studies. Additionally, ALMA detects certain molecules that cannot be probed at infrared wavelengths, while JWST is sensitive to different chemical compounds. Together, they offer a more complete view of astrophysical processes.

3. **Question**: What are the key points to include in the scientific justification when combining infrared and millimeter/sub-millimeter data?

   Answer: If millimeter/sub-millimeter data is acquired with an interferometer like ALMA, some emission will be filtered out. This is particularly crucial when constructing spectral energy distributions (SEDs). Additionally, the emission regions for infrared and millimeter wavelengths may differ due to temperature variations in dust and molecules, making direct comparisons challenging. This should be carefully justified in proposals.

4. **Question**: How should researchers plan observations for proposals requiring simultaneous or near-simultaneous JWST and ALMA data?

   Answer: Coordination is managed by the Principal Investigator (PI), not the observatories. For simultaneous or near-simultaneous observations, the PI should reach out to the observatories' contacts for assistance in scheduling.

5. **Question**: How do you decide which observatory to submit the proposal to when observing times are similar?

   Answer: According to Joint Proposal policies, the observatory where more time is requested should receive the submission. If times are identical, the PI may choose based on proposal deadlines, familiarity with the observatory, or oversubscription rates.

6. **Question**: How should spatial resolution differences between JWST and ALMA be handled in proposals?

   Answer: The proposal should demonstrate that the science goal is achievable despite resolution differences. If similar resolution is required, the justification should be clearly stated. If resolution differences are acceptable, an explanation should be included.

7. **Question**: How can observing time for JWST and ALMA be balanced to optimize scheduling and scientific return for joint proposals?

   Answer: Clearly define the science goals and required sensitivity. The joint proposal should be submitted to the facility requiring the longest observing time.

8. **Question**: How does the JWST TAC evaluate joint proposals, and what specific aspects of ALMA's technical feasibility are typically scrutinized?

   Answer: The JWST TAC prioritizes scientific merit. ALMA proposals submitted as part of JWST joint proposals must also pass ALMA's technical feasibility checks, making it important to follow both observatories' guidelines.

Slides - Introduction to JWST

STScI | SPACE TELESCOPE SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

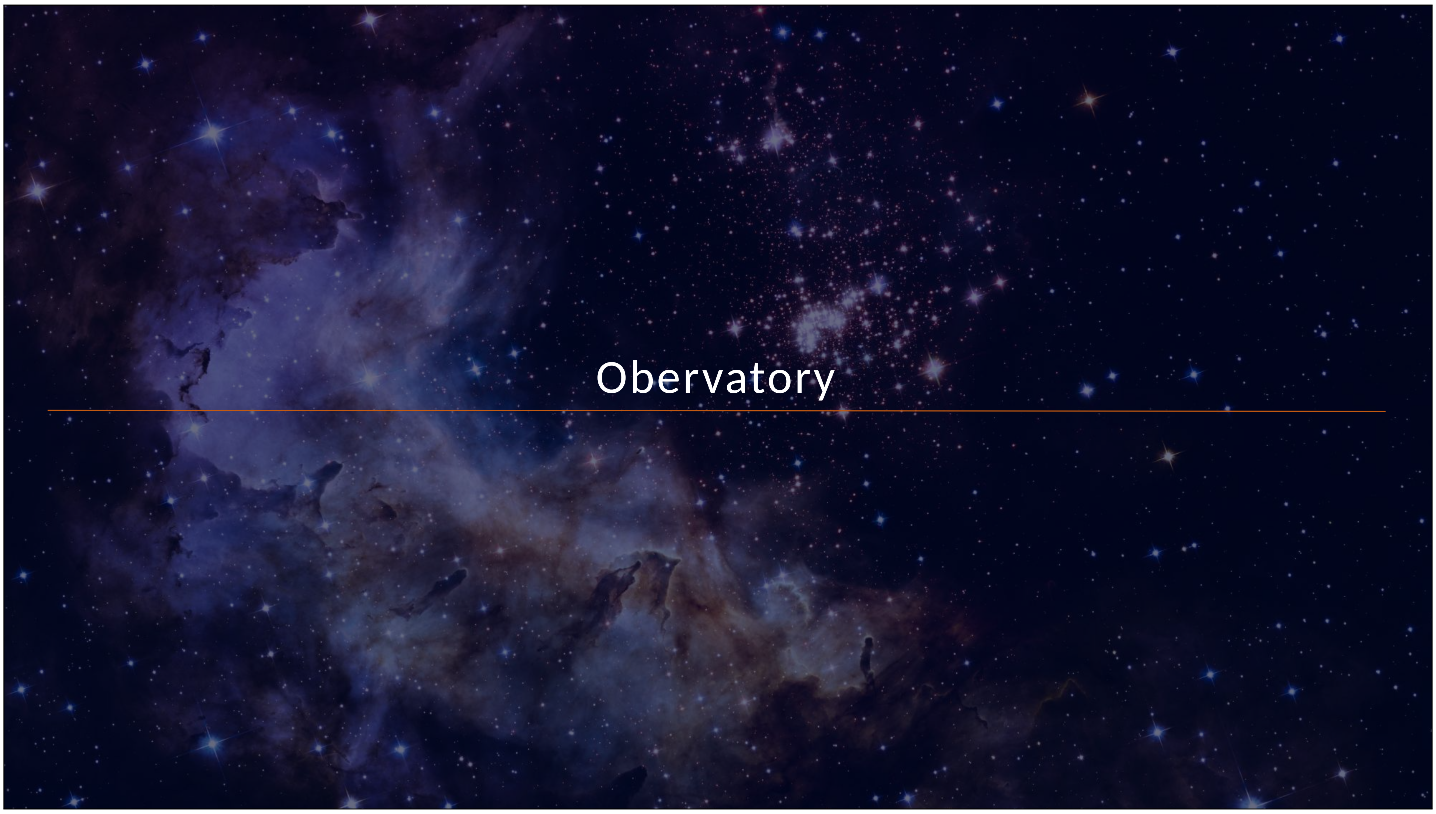
JWST Overview

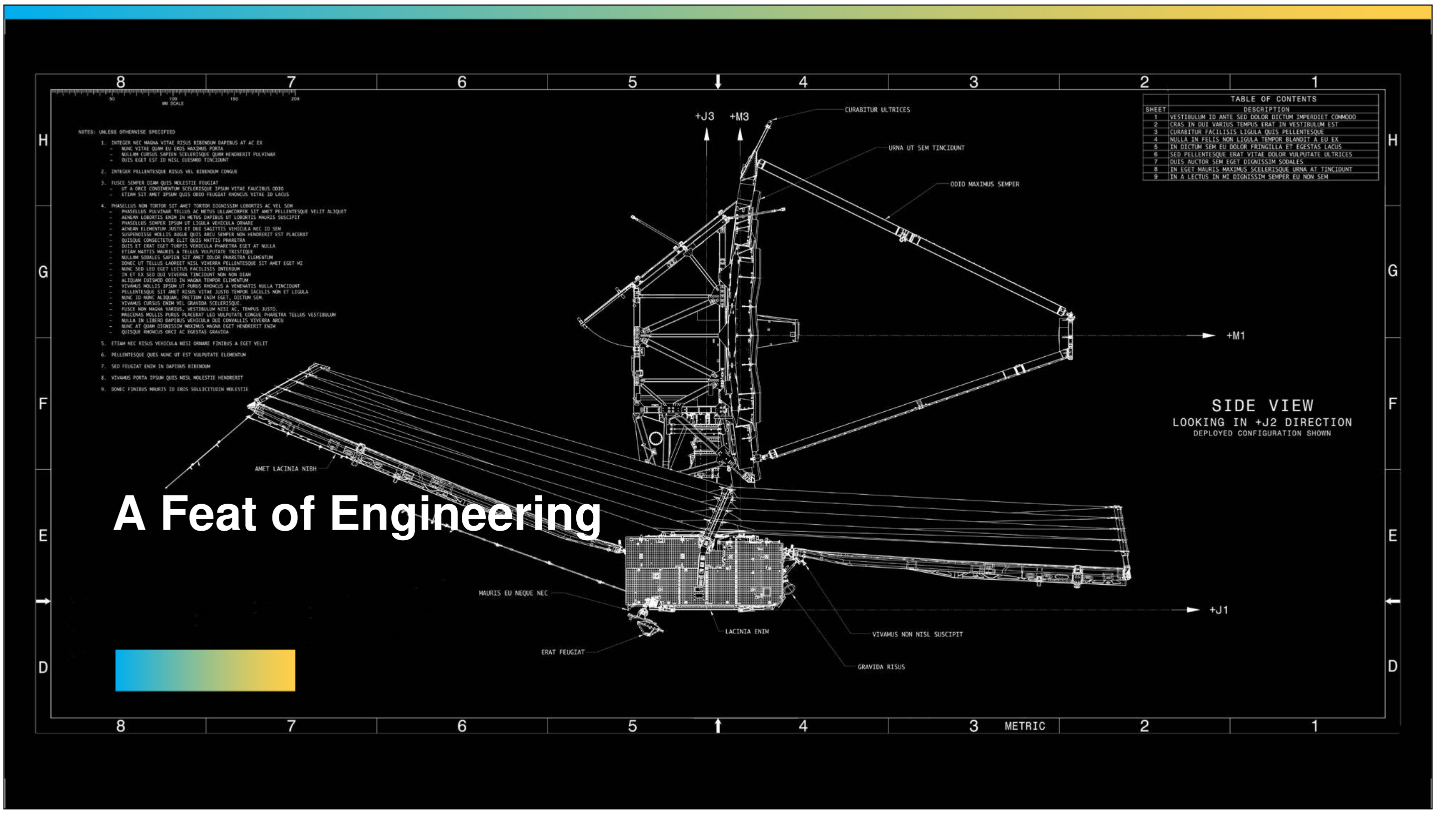
Karl D. Gordon
JWST-ALMA Workshop
Chalmers University of Technology
5 Dec 2024

Overview

- Observatory
- Instruments

- JDox for authoritative info
- Slides for multiple sources
  - Good stuff is a credit to others
  - Mistakes are all mine


Obervatory


A Feat of Engineering
SIDE VIEW
LOOKING IN +J2 DIRECTION
DEPLOYED CONFIGURATION SHOWN
TABLE OF CONTENTS
+J3
+M3
+M1
+J1
CURABITUR ULTRICES
URNA UT SEM TINCIDUNT
ODIO MAXIMUS SEMPER
AMET LACINIA NIBH
MAURIS EU NEQUE NEC
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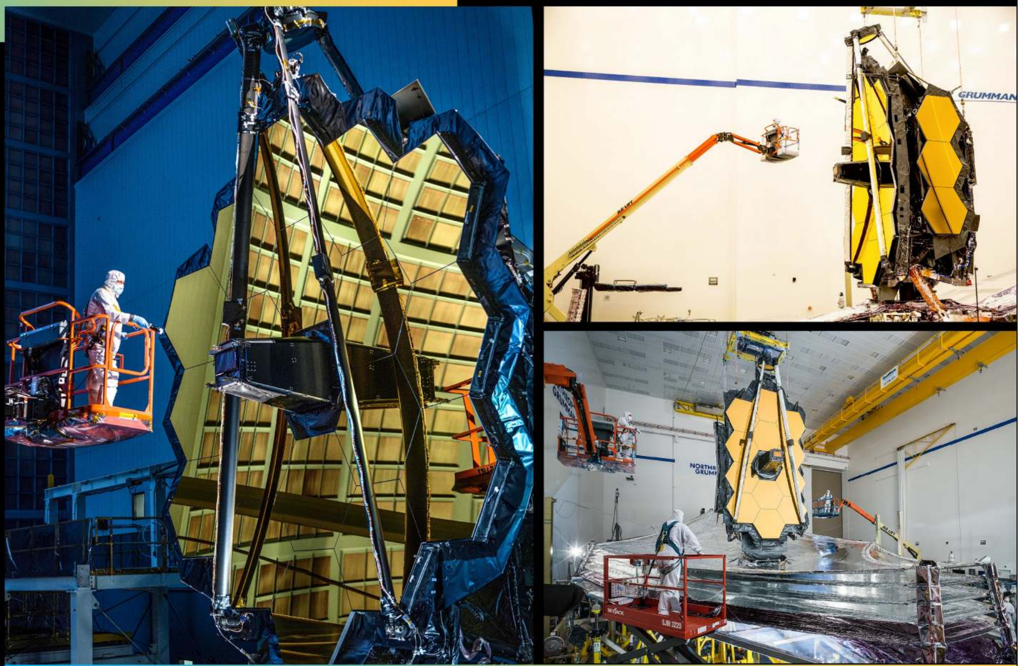
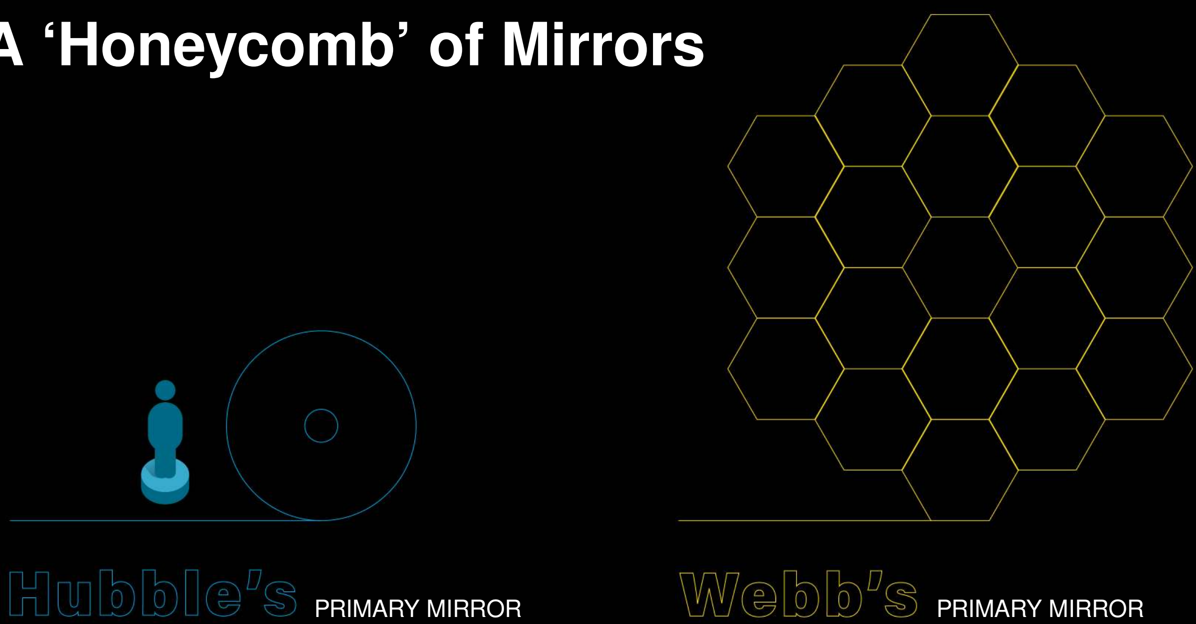
METRIC

Webb Is Big!



A ‘Honeycomb’ of Mirrors



The James Webb Space Telescope

JWST Launch
- Launch vehicle is an Ariane 5 rocket, supplied by ESA
- Site will be Arianespace's ELA-3 launch complex near Kourou, French Guiana

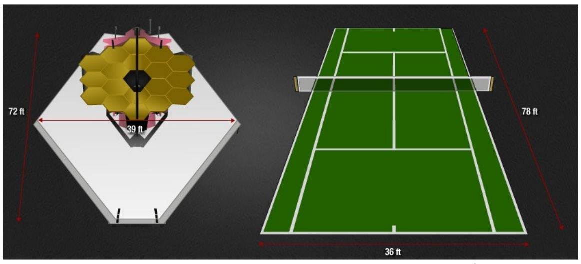
Arianespace – ESA - NASA

The James Webb Space Telescope

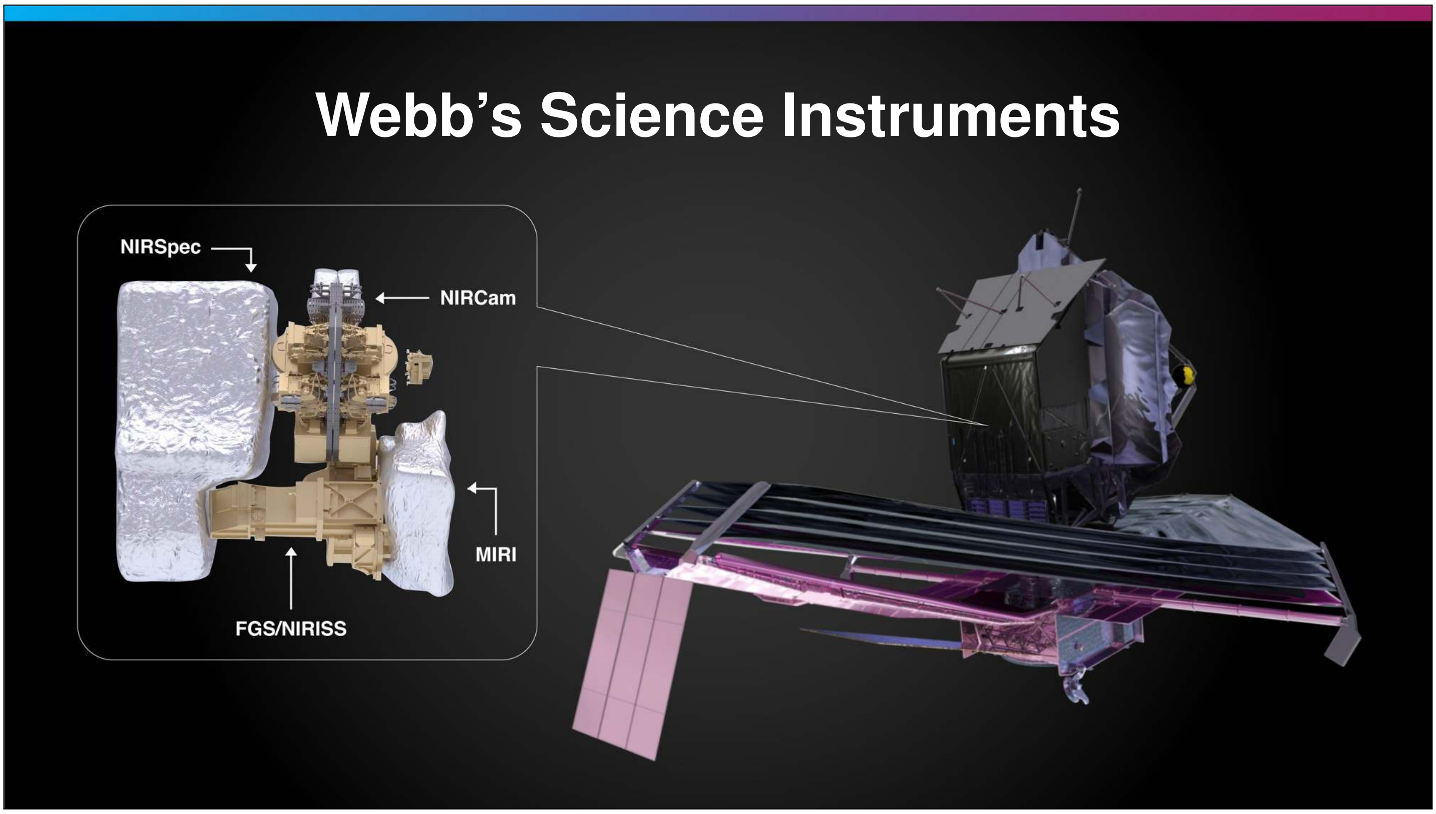
The Next Big Telescope After Hubble: JWST

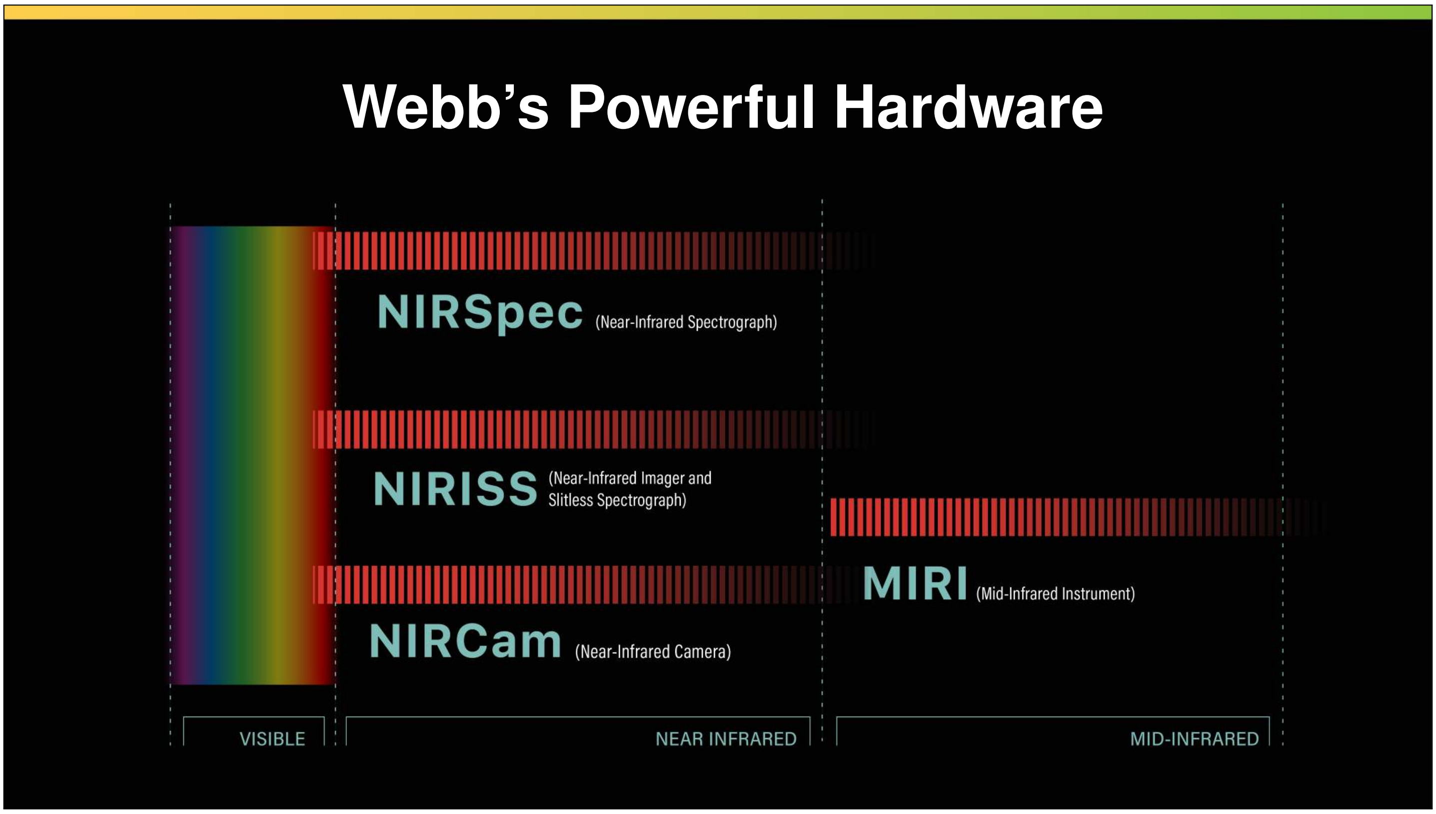
HST
- size of a school bus
- distance = 350 miles
- Orbital time (earth) = 97 minutes
- weight = 24,500 lbs
- length = 43.5 feet

JWST
- size of a tennis court
- distance = 930,000 miles
- Orbital time (Sun) = 1 year
  - weight = 14,000 lbs
- length = 72 feet
- operating temperature = 40 K



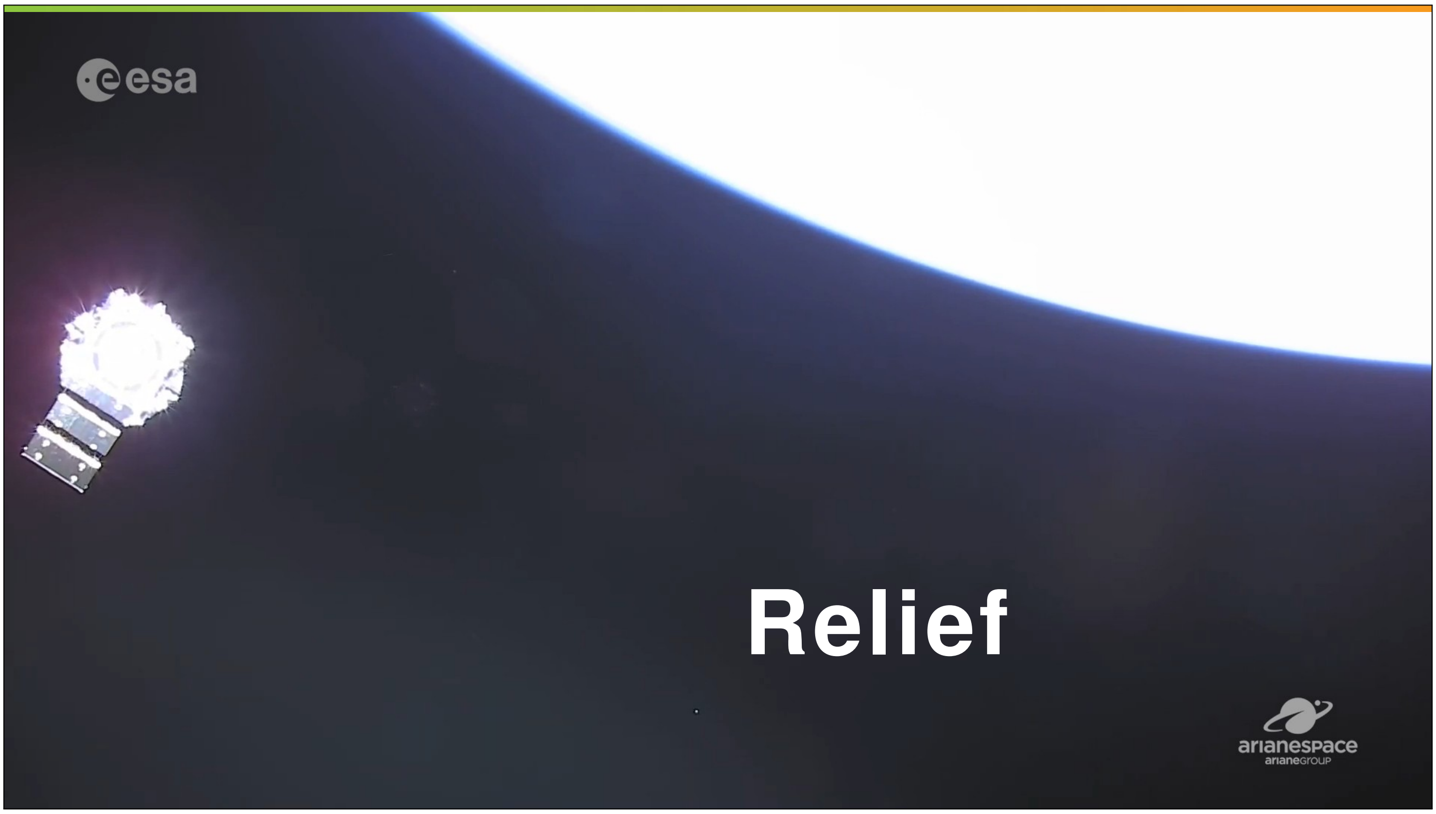
www.jwst.nasa.gov


Webb's Science Instruments
NIRSpec
NIRCam
MIRI
FGS/NIRISS


Webb's Powerful Hardware
NIRSpec (Near-Infrared Spectrograph)
NIRISS (Near-Infrared Imager and Slitless Spectrograph)
MIRI (Mid-Infrared Instrument)
NIRCam (Near-Infrared Camera)
VISIBLE
NEAR INFRARED
MID-INFRARED


Lift Off!


Webb's Journey
Begins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Relief
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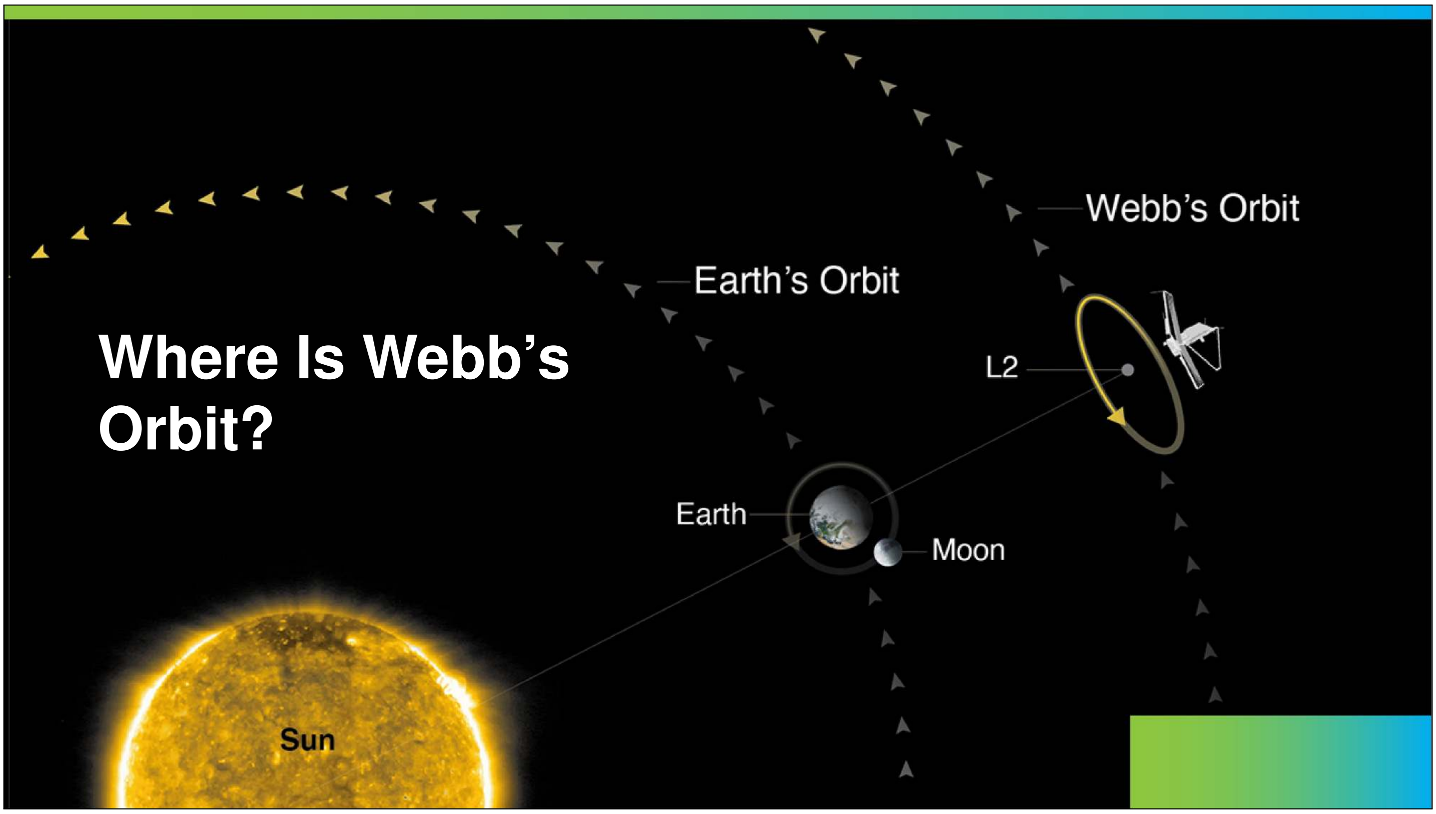
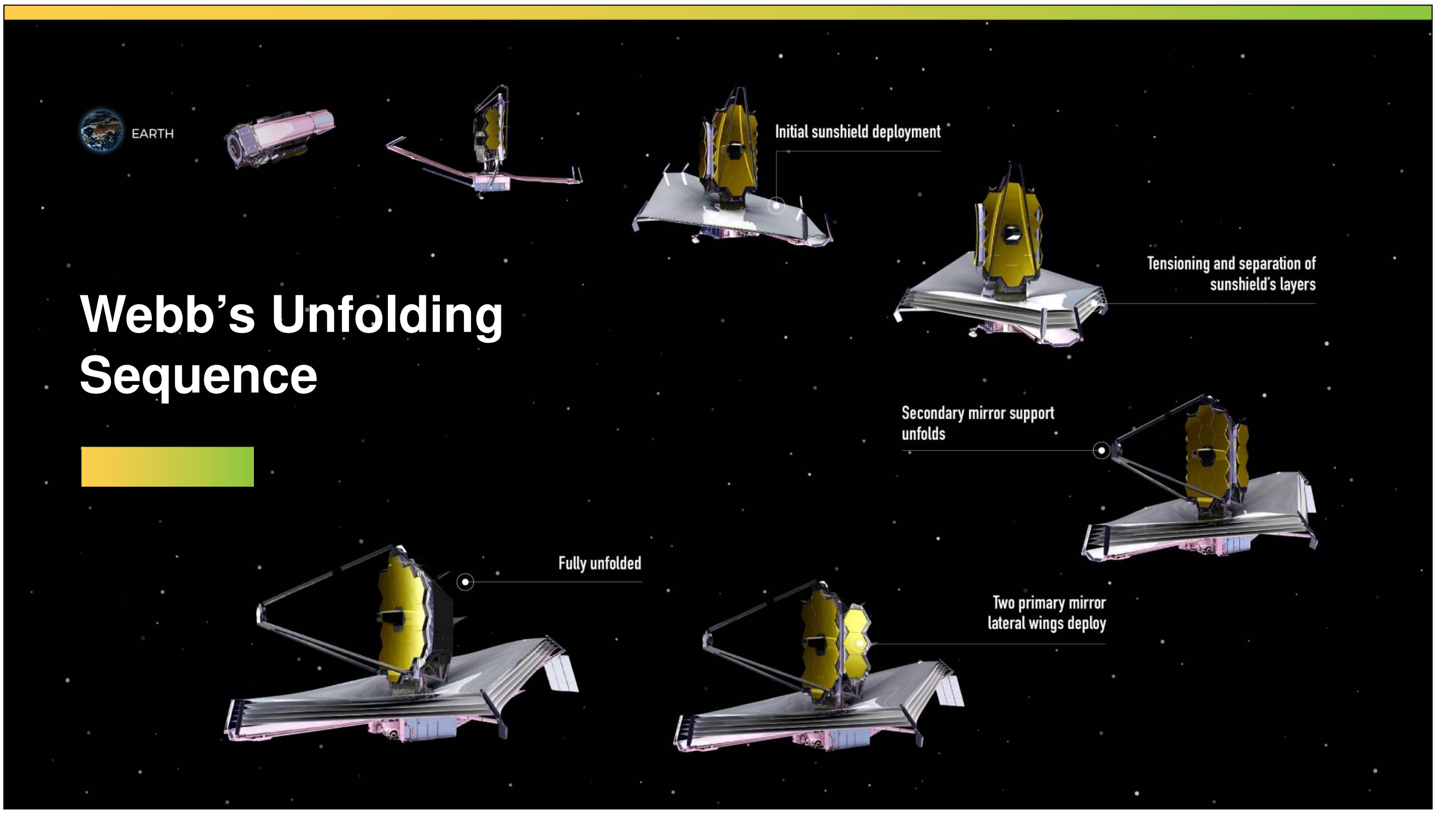
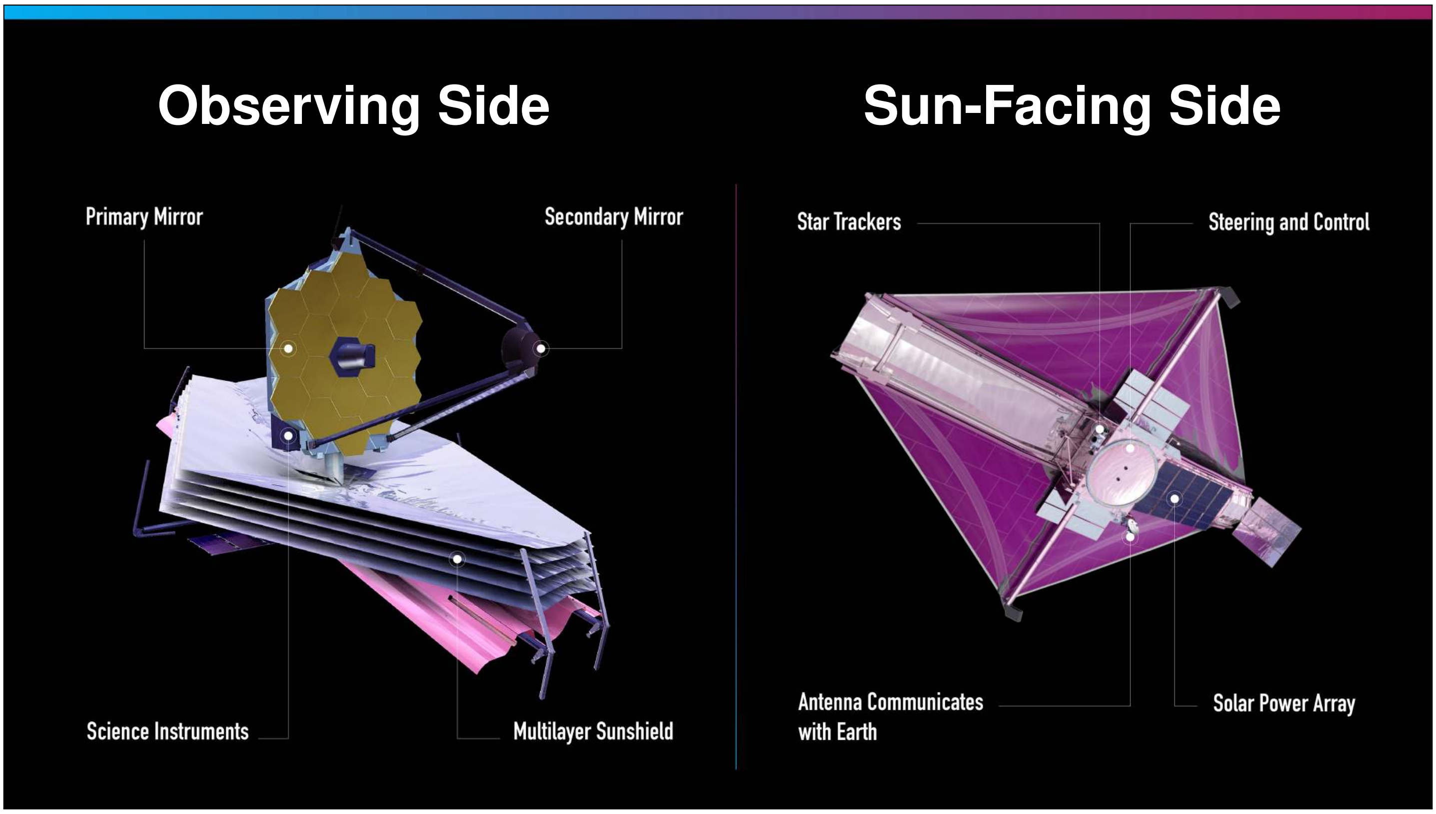
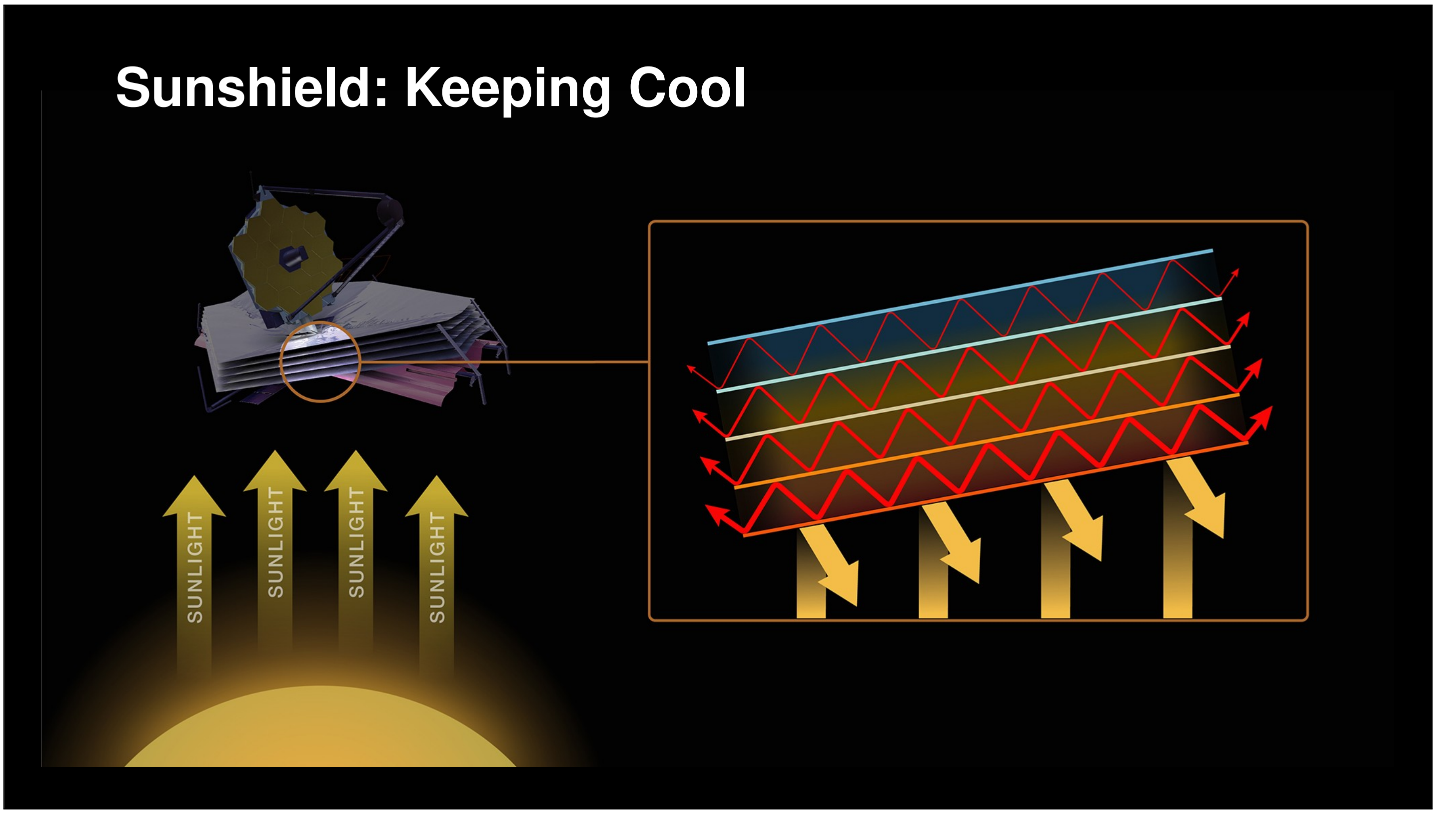
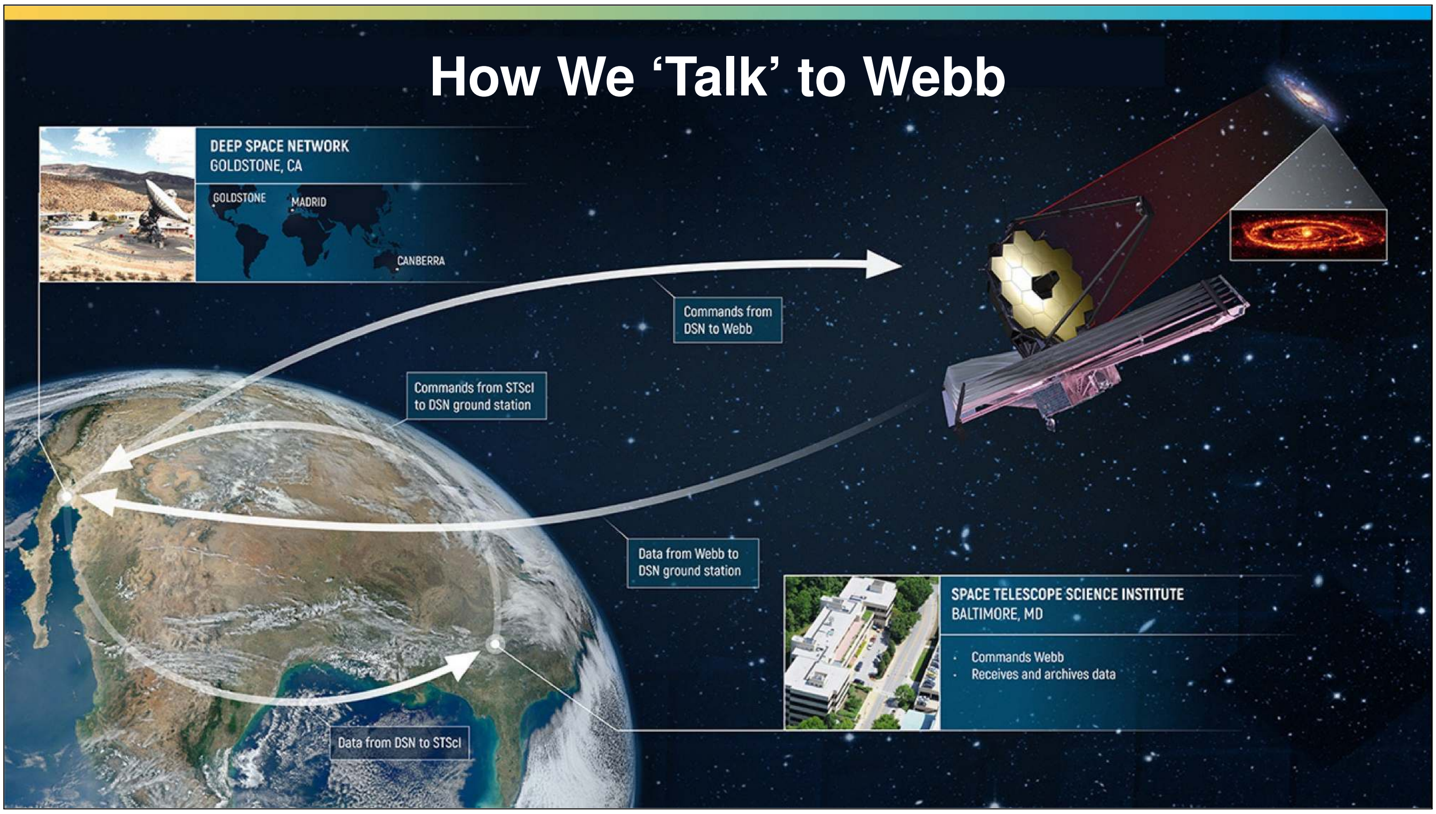
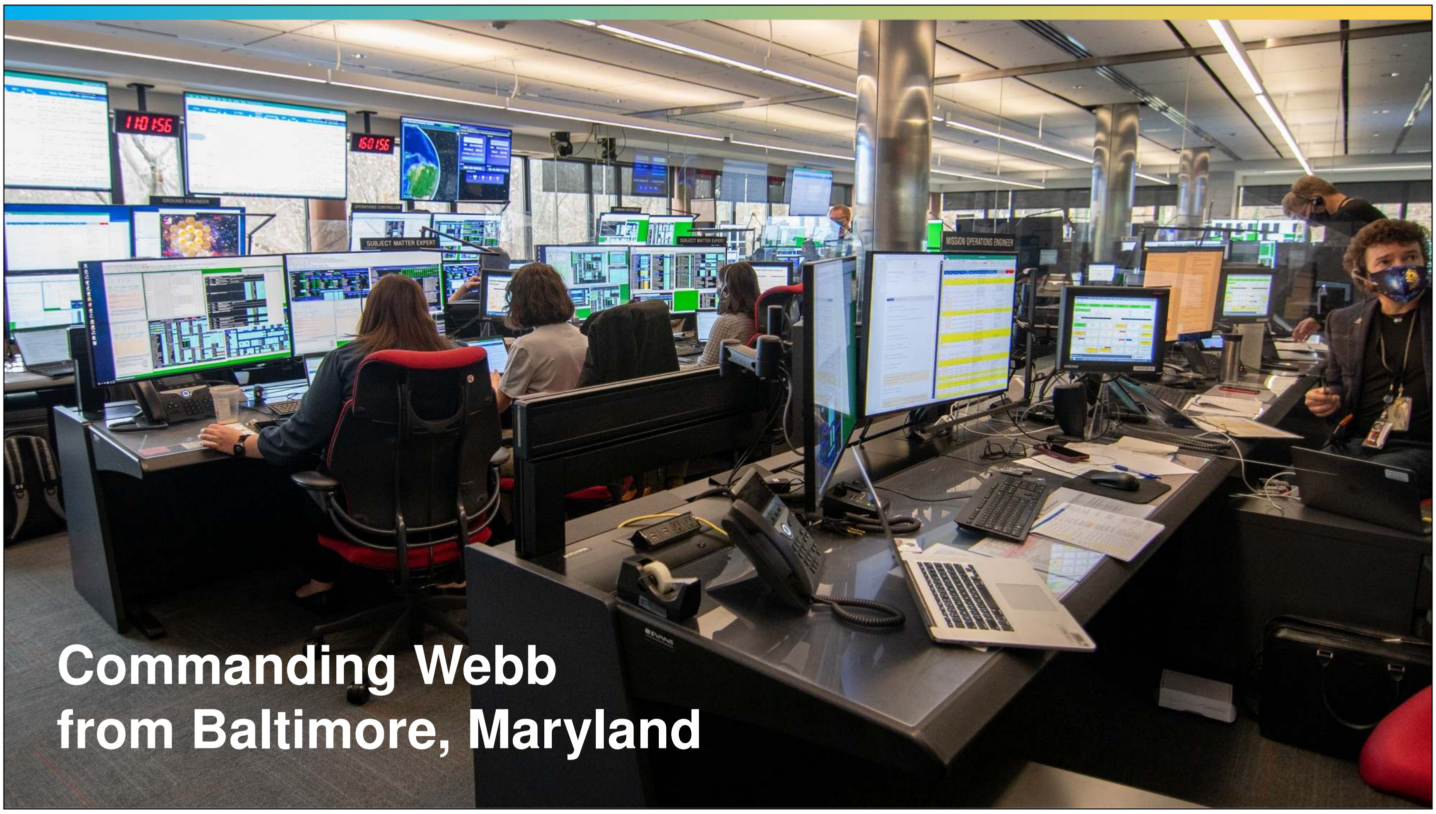

Where Is Webb's Orbit?
Webb's Orbit
Earth's Orbit
L2
Earth
Moon
Sun


EARTH
Initial sunshield deployment
Tensioning and separation of sunshield's layers
Webb's Unfolding Sequence
Secondary mirror support unfolds
Fully unfolded
Two primary mirror lateral wings deploy


Observing Side
Sun-Facing Side
Primary Mirror
Secondary Mirror
Star Trackers
Steering and Control
Science Instruments
Multilayer Sunshield
Antenna Communicates with Earth
Solar Power Array

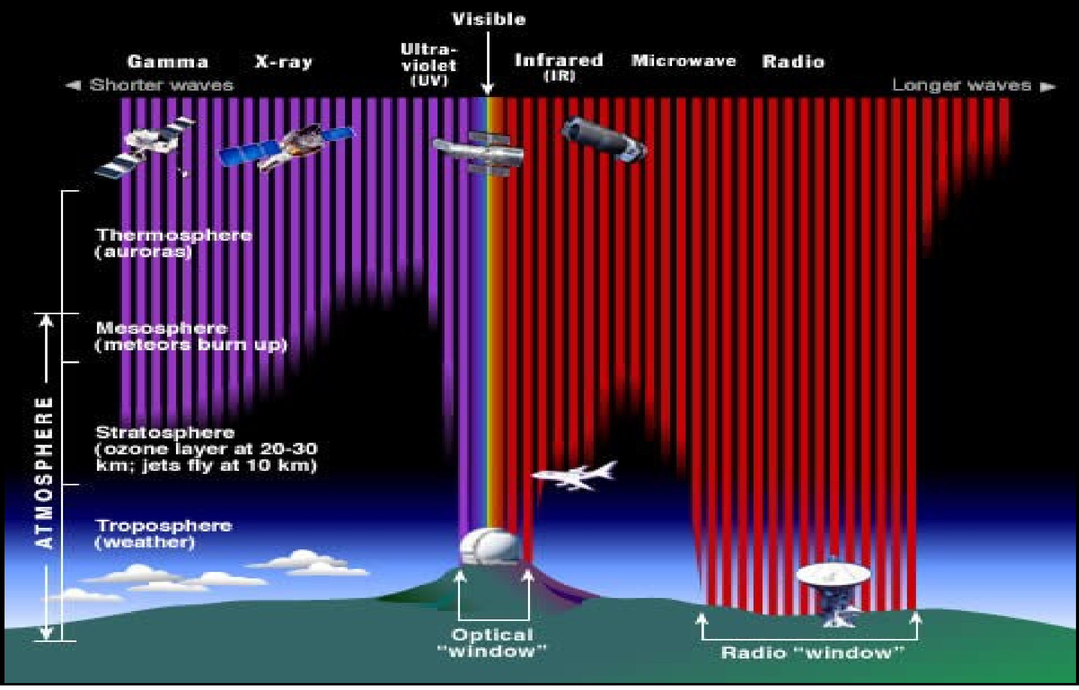

Sunshield: Keeping Cool
SUNLIGHT
SUNLIGHT
SUNLIGHT
SUNLIGHT


How We 'Talk' to Webb
DEEP SPACE NETWORK
GOLDSTONE, CA
GOLDSTONE
MADRID
CANBERRA
Commands from DSN to Webb
Commands from STScI to DSN ground station
Data from Webb to DSN ground station
SPACE TELESCOPE SCIENCE INSTITUTE
BALTIMORE, MD
Commands Webb
Receives and archives data
Data from DSN to STScI


Commanding Webb
from Baltimore, Maryland


Webb Is an International Collaboration

Why do we put telescopes in space?



The James Webb Space Telescope

James Webb (1906 – 1992)

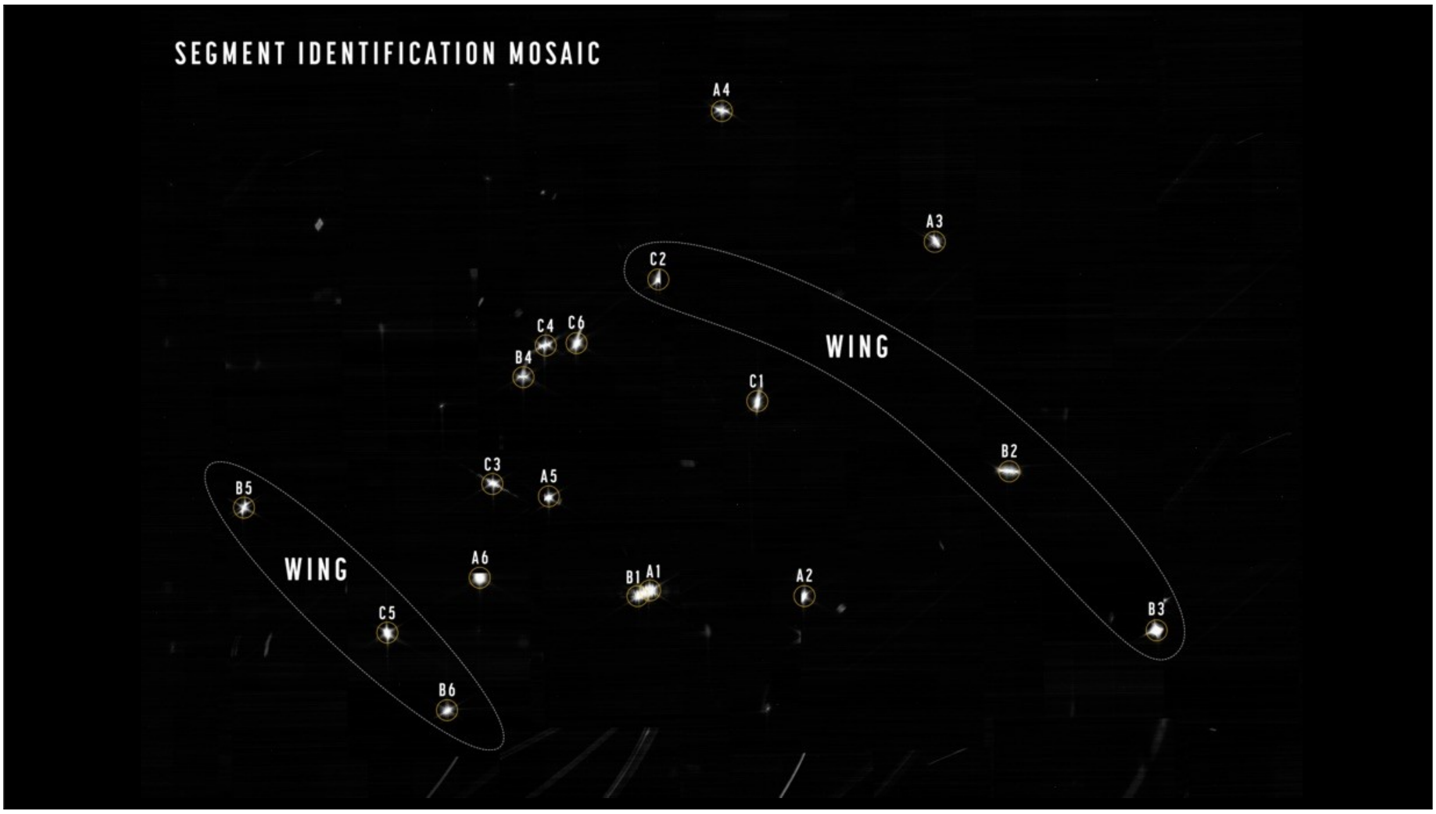
- Second Administrator of NASA (1961 – 1968)
- Oversaw first manned spaceflight program (Mercury)
- Oversaw second manned spaceflight program (Gemini)
- Oversaw Mariner and Pioneer planetary exploration programs
- Oversaw Apollo program

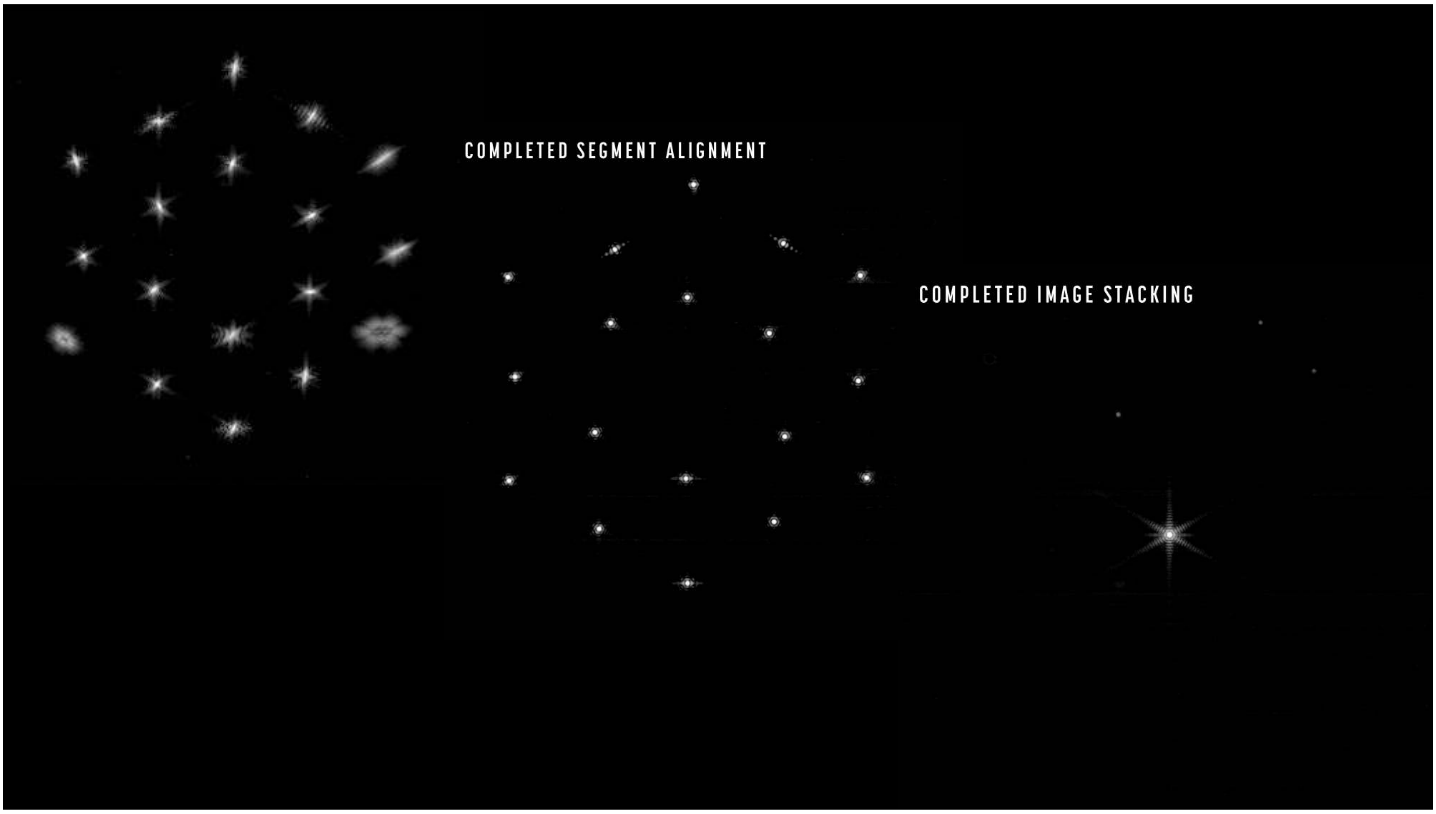
The James Webb Space Telescope

Telescopes can see different types of light
- Hubble primarily sees “visible” light, similar to our eyes
- JWST will see “Infrared” light, light that our eyes can not see
- Infrared observations can unveil hidden objects behind gas and dust

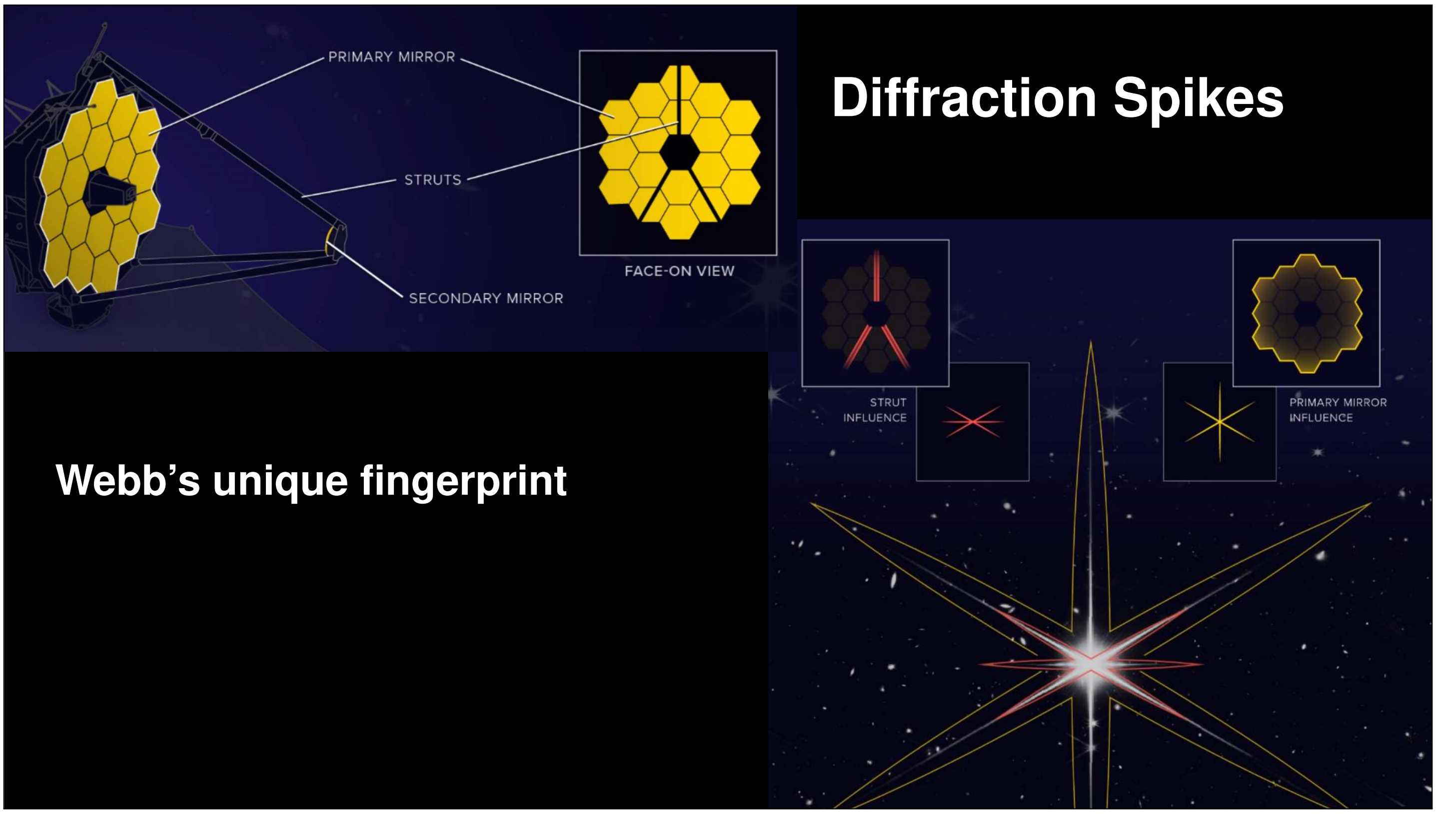
Visible Light

Infrared Light

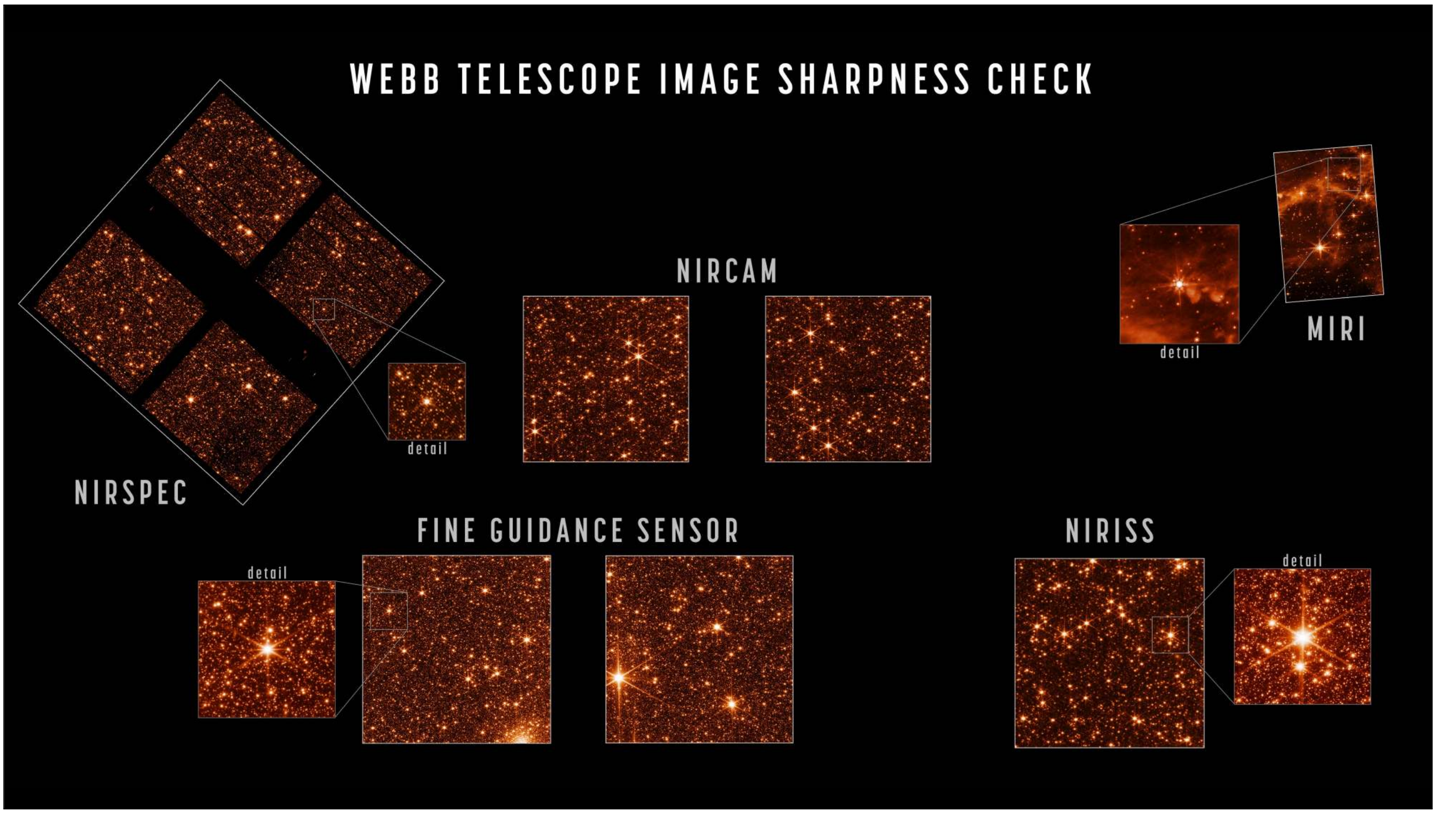

SEGMENT IDENTIFICATION MOSAIC
A4
A3
C2
WING
C4
C6
B4
C1
B2
C3
A5
B5
WING
A6
B1
A1
A2
B3
C5
B6


COMPLETED SEGMENT ALIGNMENT
COMPLETED IMAGE STACKING


TELESCOPE ALIGNMENT EVALUATION IMAGE
Many sighs of relief!


Diffraction Spikes
PRIMARY MIRROR
STRUTS
SECONDARY MIRROR
FACE-ON VIEW
STRUT INFLUENCE
PRIMARY MIRROR INFLUENCE
Webb’s unique fingerprint


Instruments


WEBB TELESCOPE IMAGE SHARPNESS CHECK
NIRSPEC
detail
NIRCAM
MIRI
detail
FINE GUIDANCE SENSOR
detail
NIRISS
detail

Near Infrared Camera

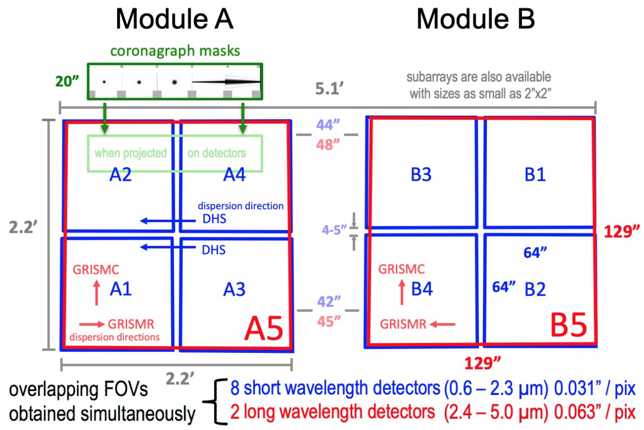


Table 1. Properties of NIRCam observing modes

Observing mode	Wavelength coverage (μm)	Field of view§	Pixel scale (arcsec/pix)	Notes
Imaging	0.6–2.3	2 × 132" × 132" (44" and 5" gaps)	0.031	FWHM 2 pix at 2.0 μm
	2.4–5.0	2 × 129" × 129" (48" gap)	0.063	FWHM 2 pix at 4.0 μm
Coronagraphic imaging	1.8–2.2 2.8–5.0	20" × 20"	0.031 0.063	
Wide field slitless spectroscopy	2.4–5.0	2 × 129" × 129"	0.063	R ~ 1,600 at 4 μm
Time-series imaging	0.6–2.3 2.4–5.0	129" × 129" 132" × 132"	0.031 0.063	
Grism time series	0.6–2.3 2.4–5.0	129" × 129"	0.031 0.063	R ~ 300 R ~ 1,600 at 4 μm

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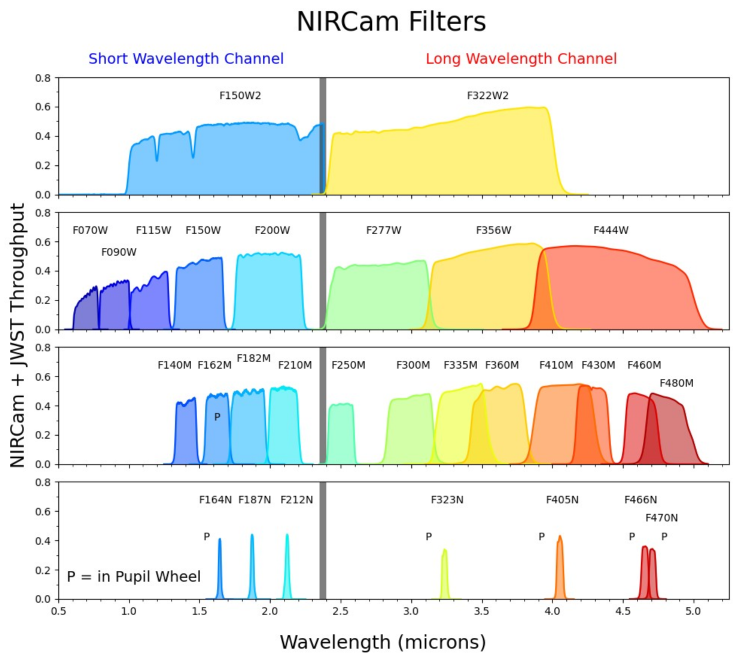
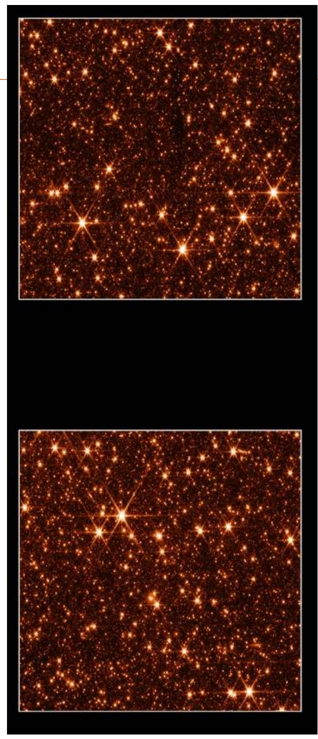
NIRCam Imaging





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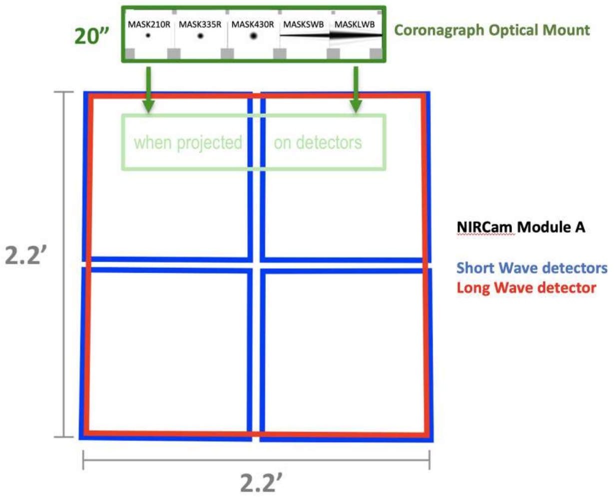
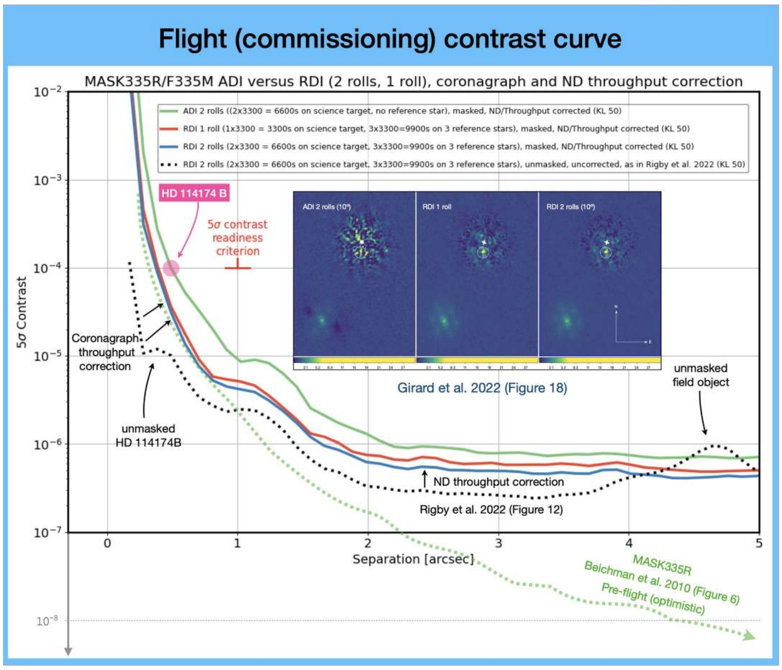
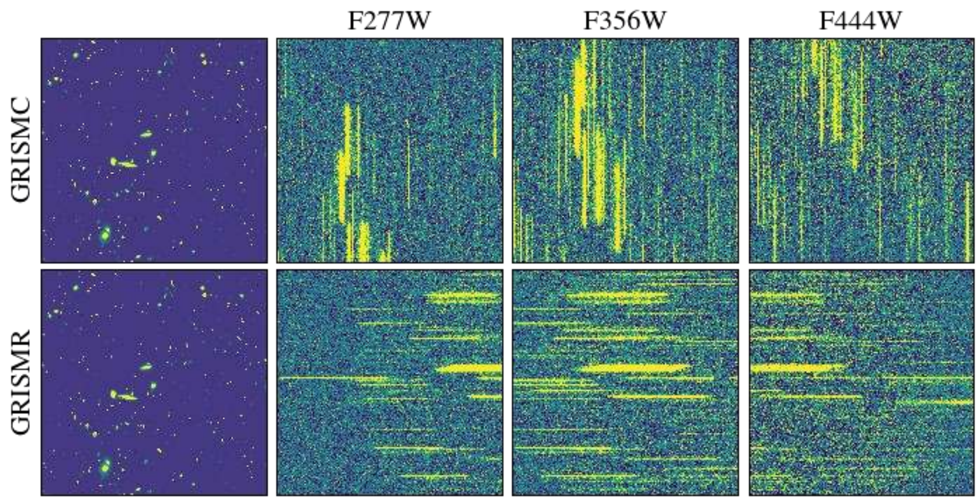
NIRCam Coronagraphy





NIRCam Wide Field Slitless



Near Infrared Spectrograph

Table 1. Characteristics of NIRSpec oberving modes

Observing mode	Aperture or slit size (arcsec)	Wavelength coverage (μm)	Pixel scale (arcsec/pixel)	Resolving power†
MSA spectroscopy	0.20 × 0.46 (individual shutter size in the dispersion direction × spatial direction)††	0.6–5.3 μm (prism) 0.7–1.27 μm (f070lp) 0.97–1.89 μm (f100lp) 1.66–3.17 μm (f170lp) 2.87–5.27 μm (f295lp)	0.1	~100 (Prism), ~1,000 (medium-resolution gratings), ~2,700 (high-resolution gratings)
IFU spectroscopy	3.0 × 3.0			
Fixed slit spectroscopy	0.2 × 3.2 0.4 × 3.65 1.6 × 1.6			
Bright object time series	1.6 × 1.6			

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NIRSpec Multi Object Spectroscopy

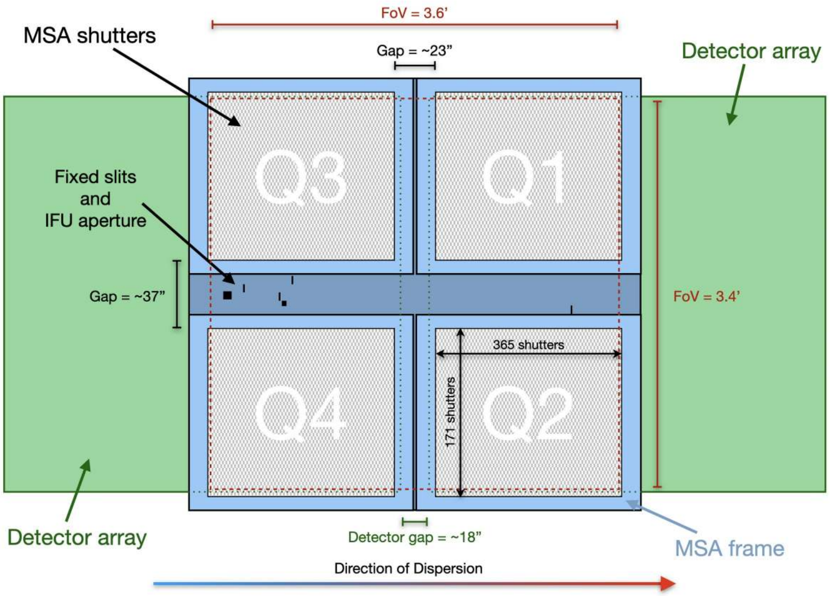

Table 1. Spectral configurations available in NIRSpec MOS mode

Disperser-filter combination	Nominal resolving power	Wavelength range † (μm)
G140M/F070LP	~1,000	0.70–1.27
G140M/F100LP		0.97–1.84
G235M/F170LP		1.66–3.07
G395M/F290LP		2.87–5.10
G140H/F070LP	~2,700	0.81–1.27
G140H/F100LP		0.97–1.82
G235H/F170LP		1.66–3.05
G395H/F290LP		2.87–5.14
PRISM/CLEAR	~100	0.60-5.30

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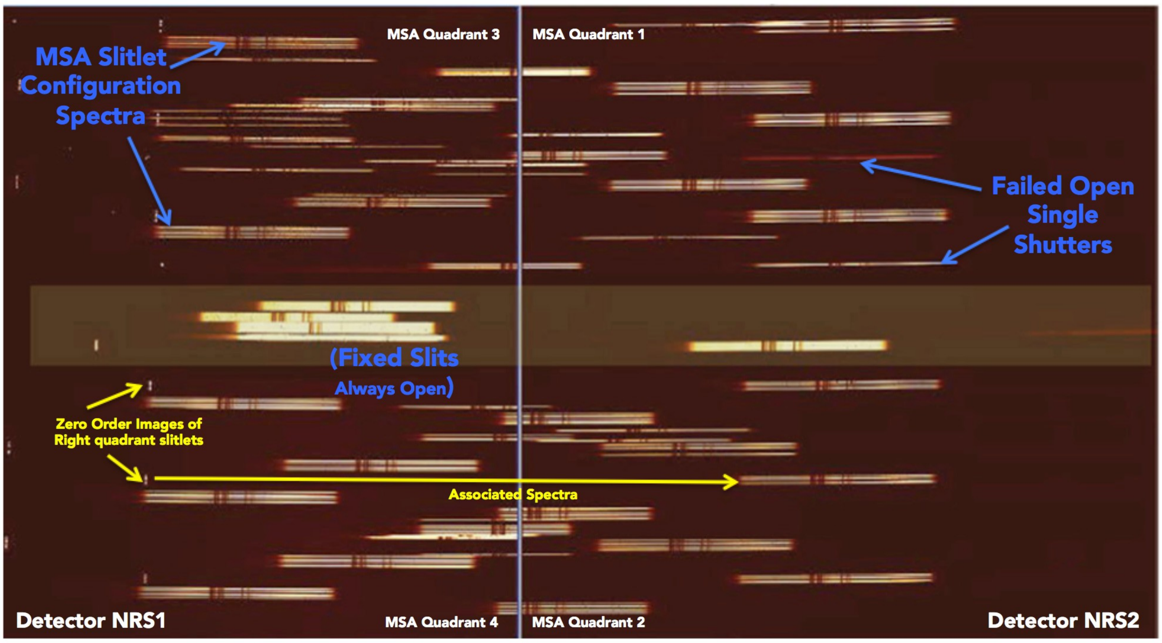
NIRSpec example



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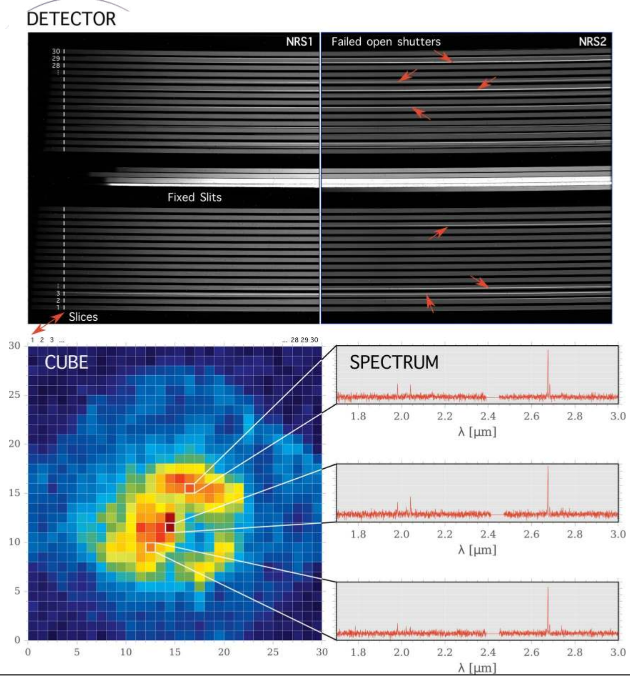
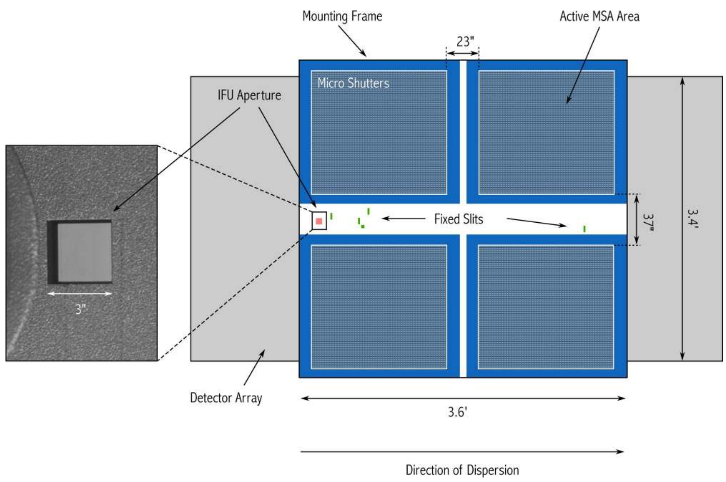
NIRSpec Integral Field Unit





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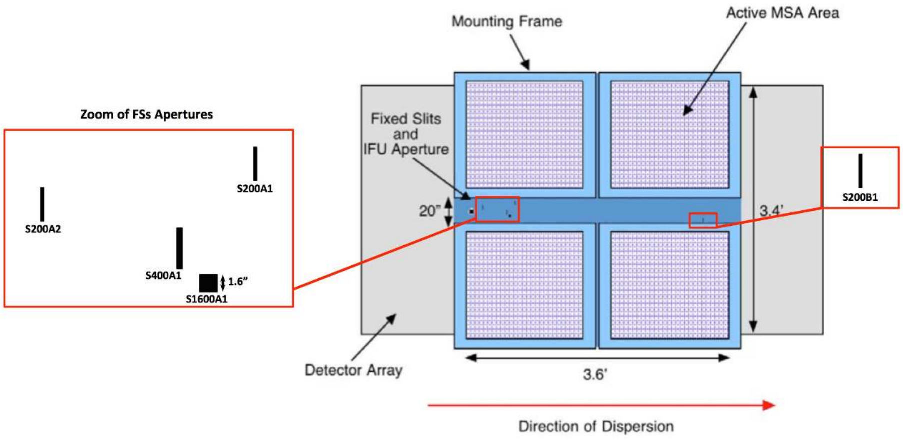
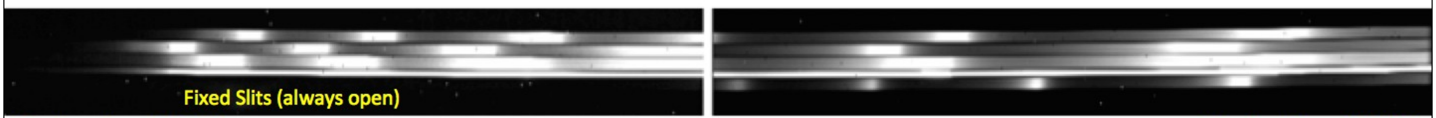
NIRSpec Fixed Slits

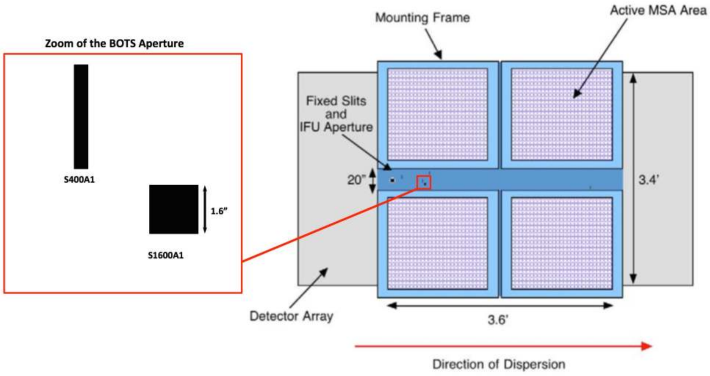


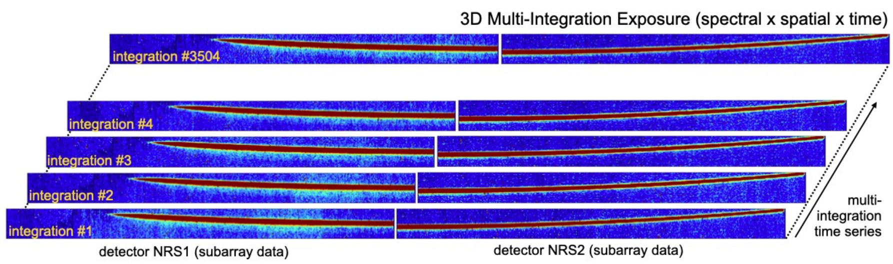


Detector NRS1

Detector NRS2

NIRSpec Bright Object Time Series





Near Infared Imaging and Slitless Spectrograph

Observing mode	Wavelength coverage (µm)	Field of view (arcsec)	Pixel scale (arcsec/ pixel)	Resolving power $R = \lambda/\Delta\lambda$	FWHM	Comment
Wide field slitless spectroscopy (WFSS)	0.8–2.2	133 × 133	0.066″/pixel	150 @ 1.4 µm	...	Orthogonal dispersion orientations available
Single object slitless spectroscopy (SOSS)	0.6–2.8	...	0.066″/pixel	700 @ 1.4 µm	...	Subarrays are standard; full frame allowed
Aperture masking interferometry (AMI)	2.8–4.8	5.2 × 5.2	0.066″/pixel	...	...	Subarray is standard; full frame allowed
Imaging	0.8–5.0	133 × 133	0.066″/pixel	4–10	F380M filter and longer wavelength filters are Nyquist sampled	Full frame standard

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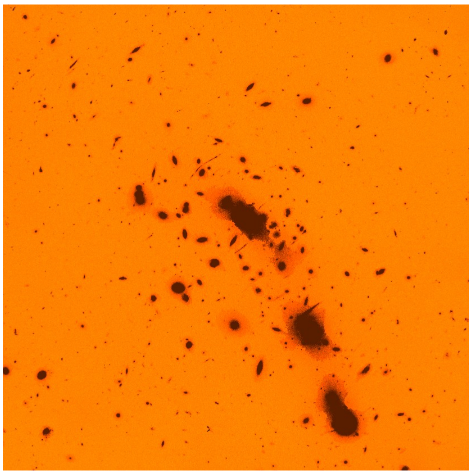
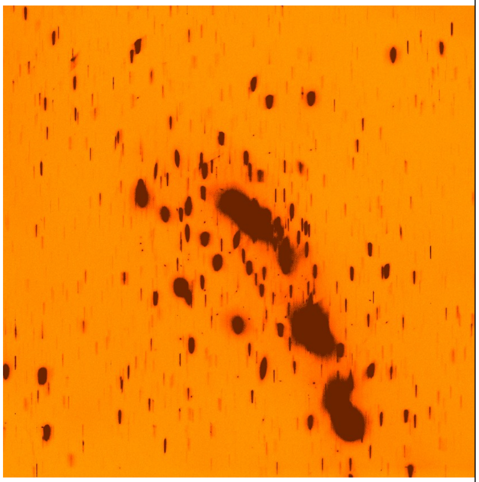
NIRISS Wide Field Slitless





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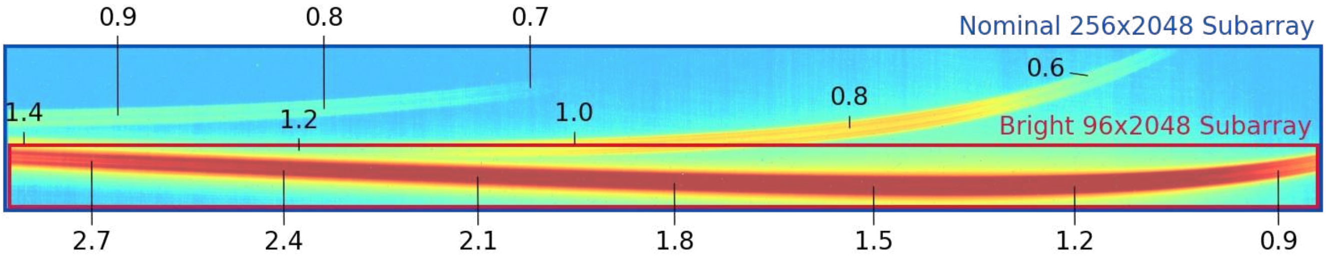
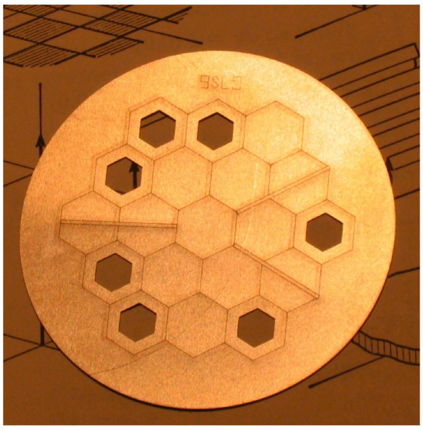
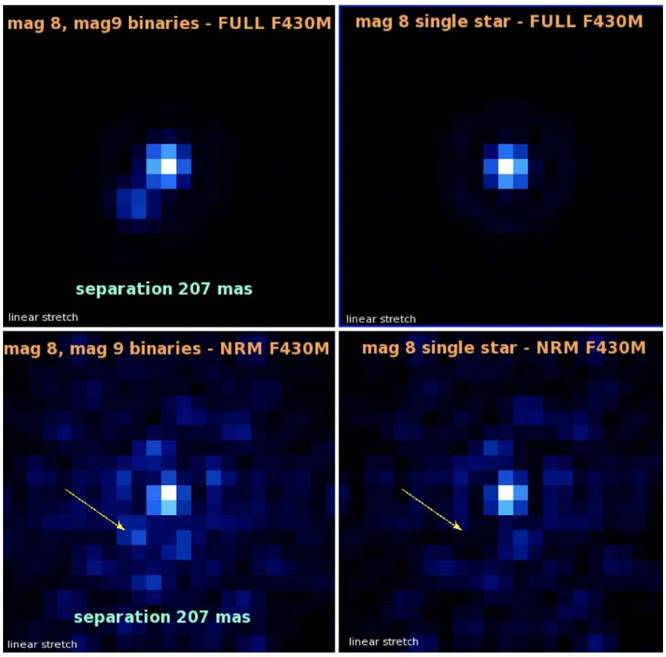
NIRISS Single Object Slitless Spectroscopy

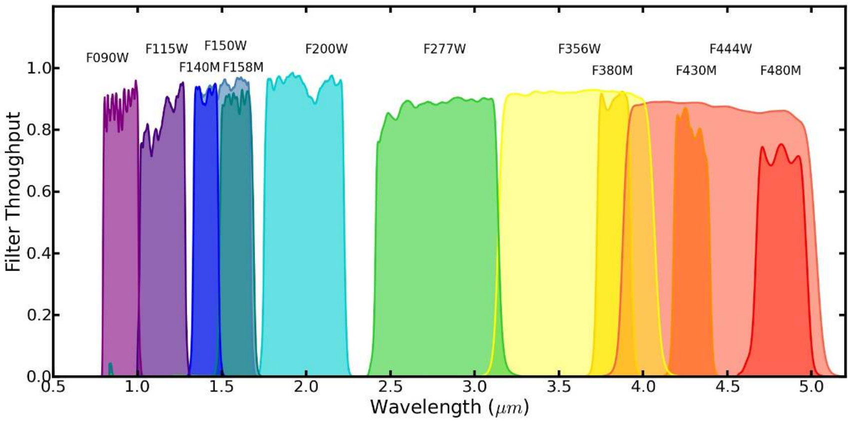


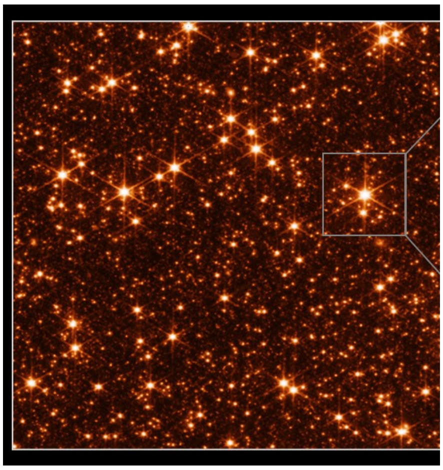
NIRISS Aperture Masking Interferometry





NIRISS Imaging





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Mid Infrared Instrument

Table 1. Properties of MIRI observing modes

Observing mode	Wavelength coverage (µm)	Field of view or slit size (arcsec)	Pixel scale ("/pixel)	Resolving power R = λ/Δλ	FWHM	Notes
Imaging	5.6 to 25.5 µm	74 × 113	0.11	3.5 – 16.1	2 pix @ 6.25 µm	Subarrays available FWHM = 2 pix × (λ/6.25 µm) for λ > 6.25 µm
4QPM coronagraphic Imaging	10.65, 11.4, 15.5	24 × 24	0.11	14.1 – 17.2	2 pix @ 6.25 µm	
Lyot coronagraphic Imaging	23	30 × 30	0.11	4.1	2 pix @ 6.25 µm	
Low-resolution spectroscopy	5 to 14 µm	0.51 × 4.7 (slit size)	0.11	~100 @ 7.5 µm	2.6 pix @ 7.7 µm	Slit or slitless modes
Medium-resolution spectroscopy	4.9 to 27.9 µm	3.7 to 7.7	0.196–0.273	~1550–3250	2 pix @ 6.2 µm	FWHM = 0.314" × (λ/10 µm) for λ > 8 µm

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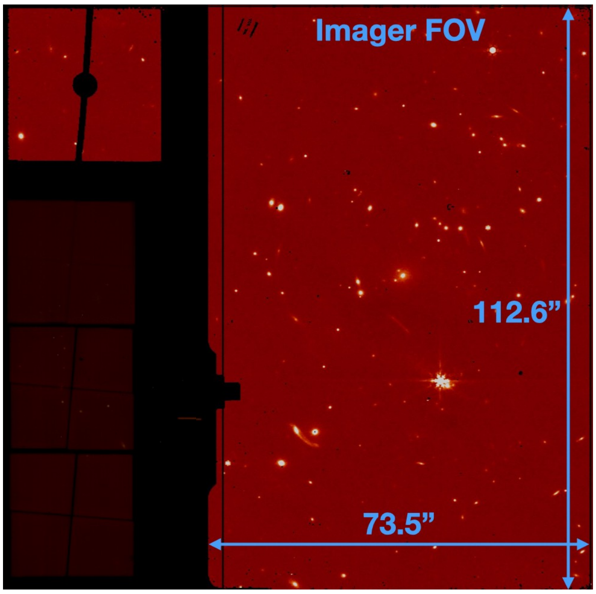
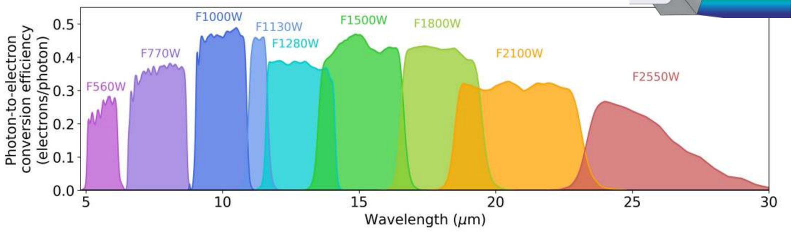
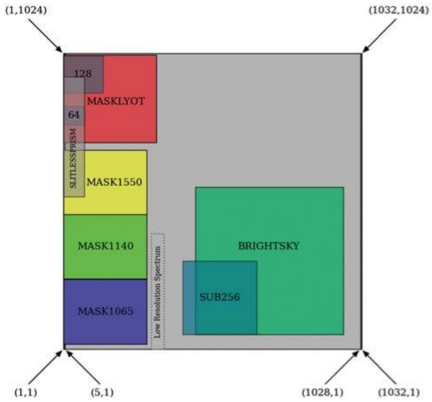
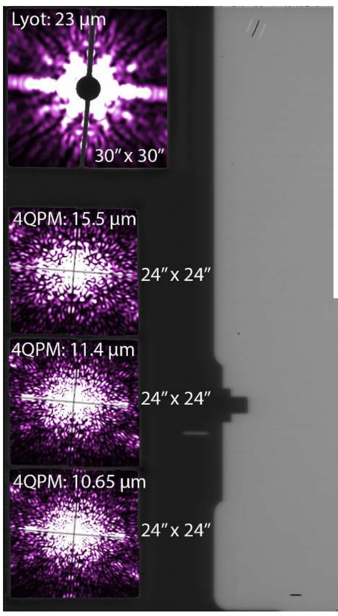
MIRI Imaging







MIRI Coronagraphic Imaging



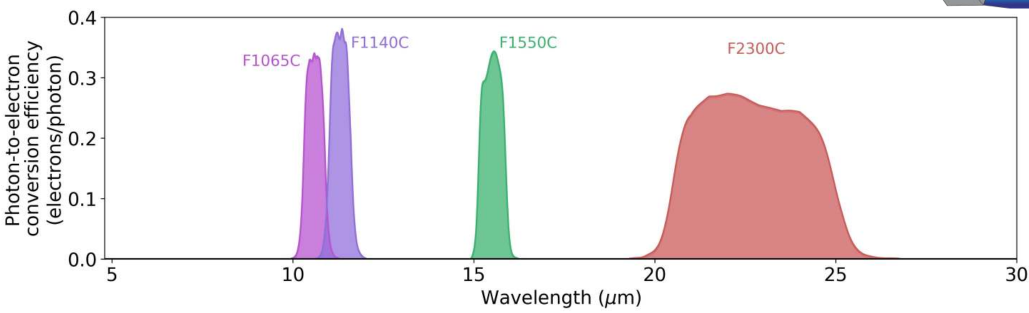
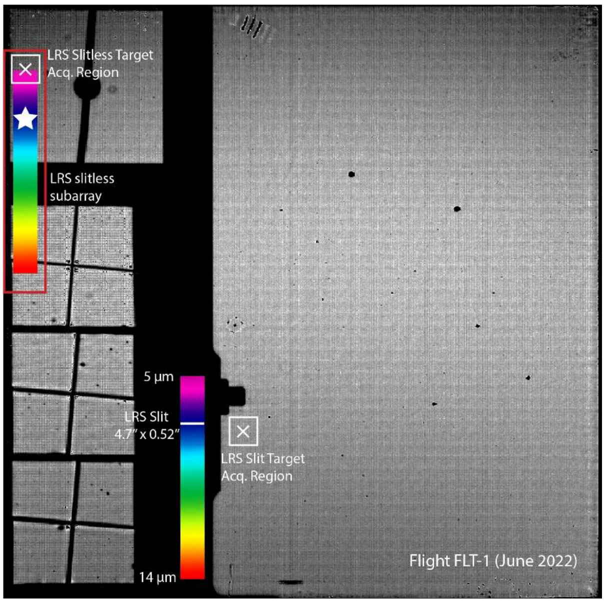


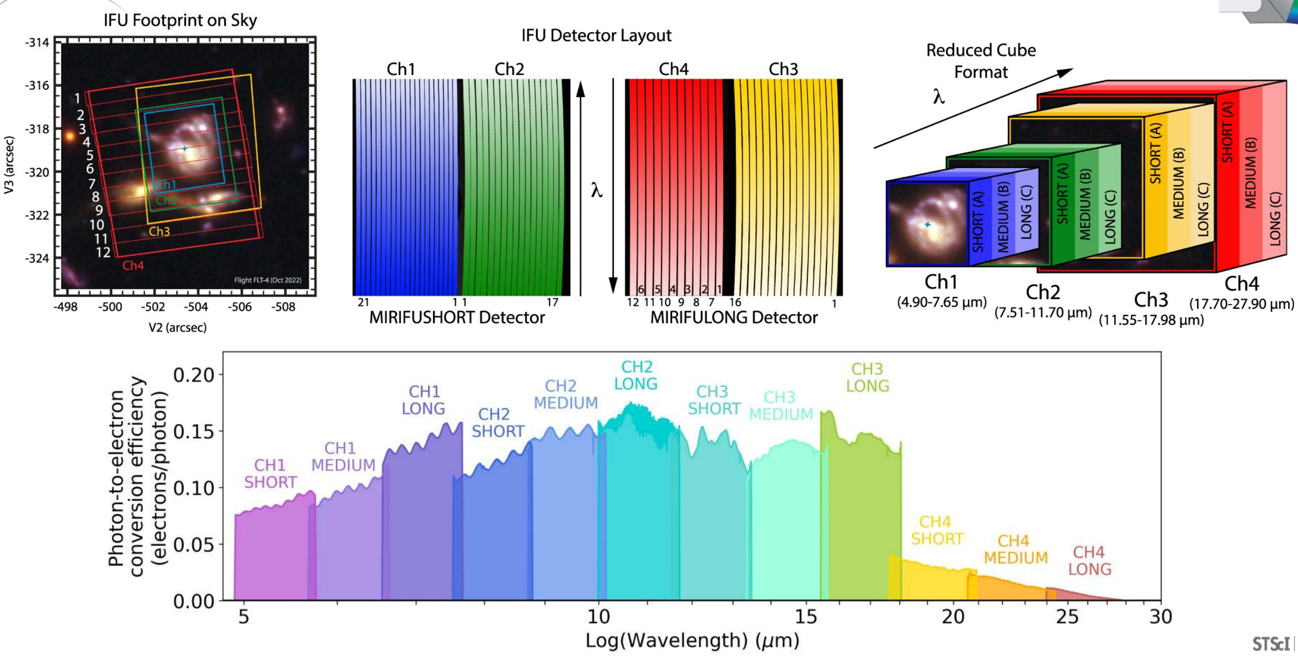
Table 1. Filter-coronagraph pair properties (Filters and Masks are not interchangeable; selecting the filter automatically selects the mask)

Filter	Coronagraph	Pupil mask transmission (%)†	Central wavelength (μm)	Bandwidth‡ (μm)	IWA§ (arcsec)	Rejection* (on-axis)
F1065C¶	4QPM1	62	10.575	0.75	0.33	260
F1140C	4QPM2	62	11.30	0.8	0.36	285
F1550C	4QPM3	62	15.50	0.9	0.49	310
F2300C	Lyot spot◊	72	22.75	5.5	2.16	850

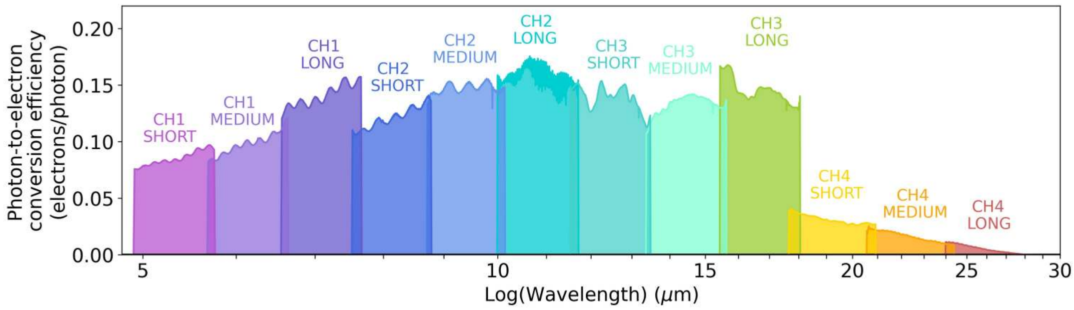
MIRI Low Resolution Spectroscopy

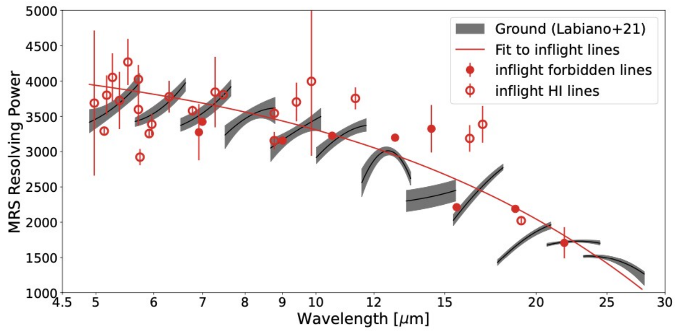


MIRI Medium Resolution Spectroscopy



MIRI Medium Resolution Spectroscopy





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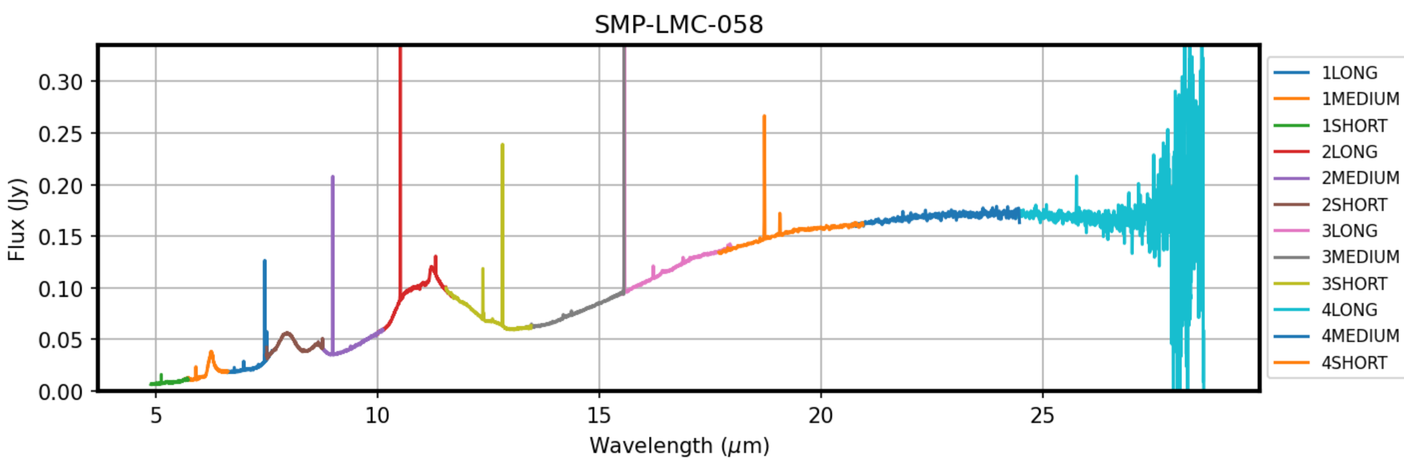
MIRI Medium Resolution Spectroscopy



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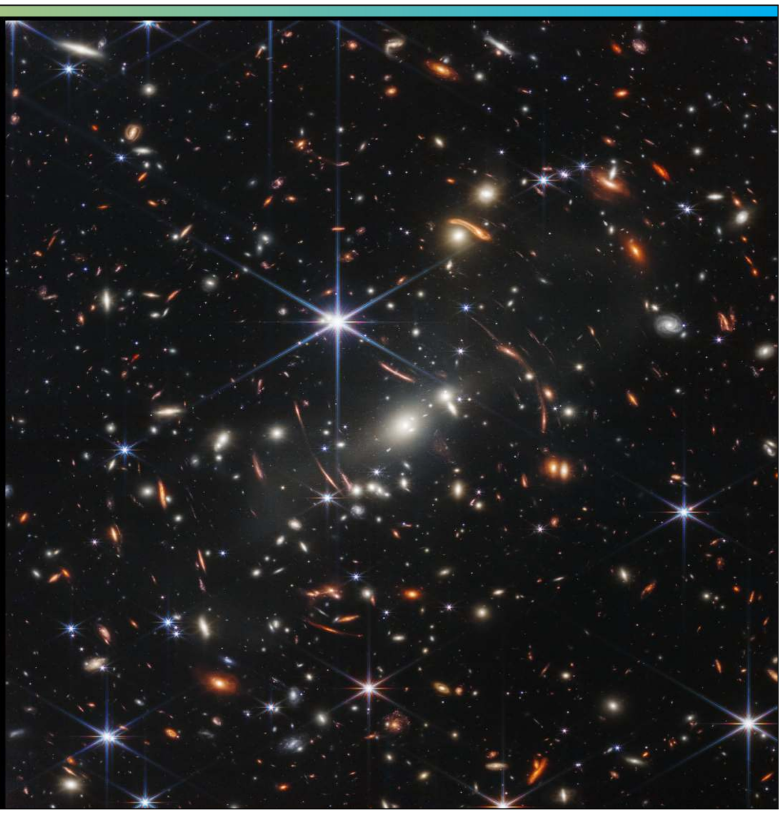
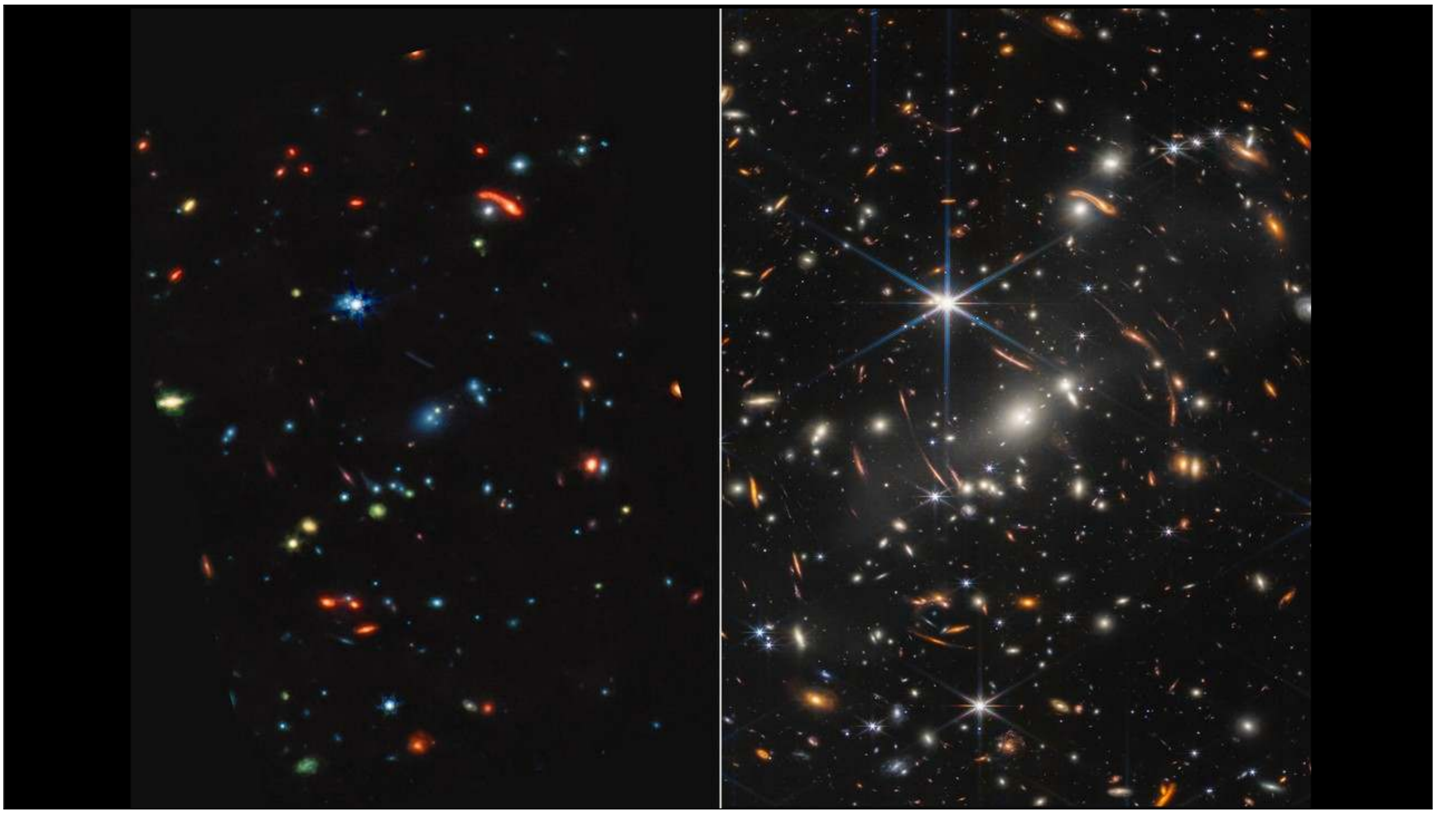
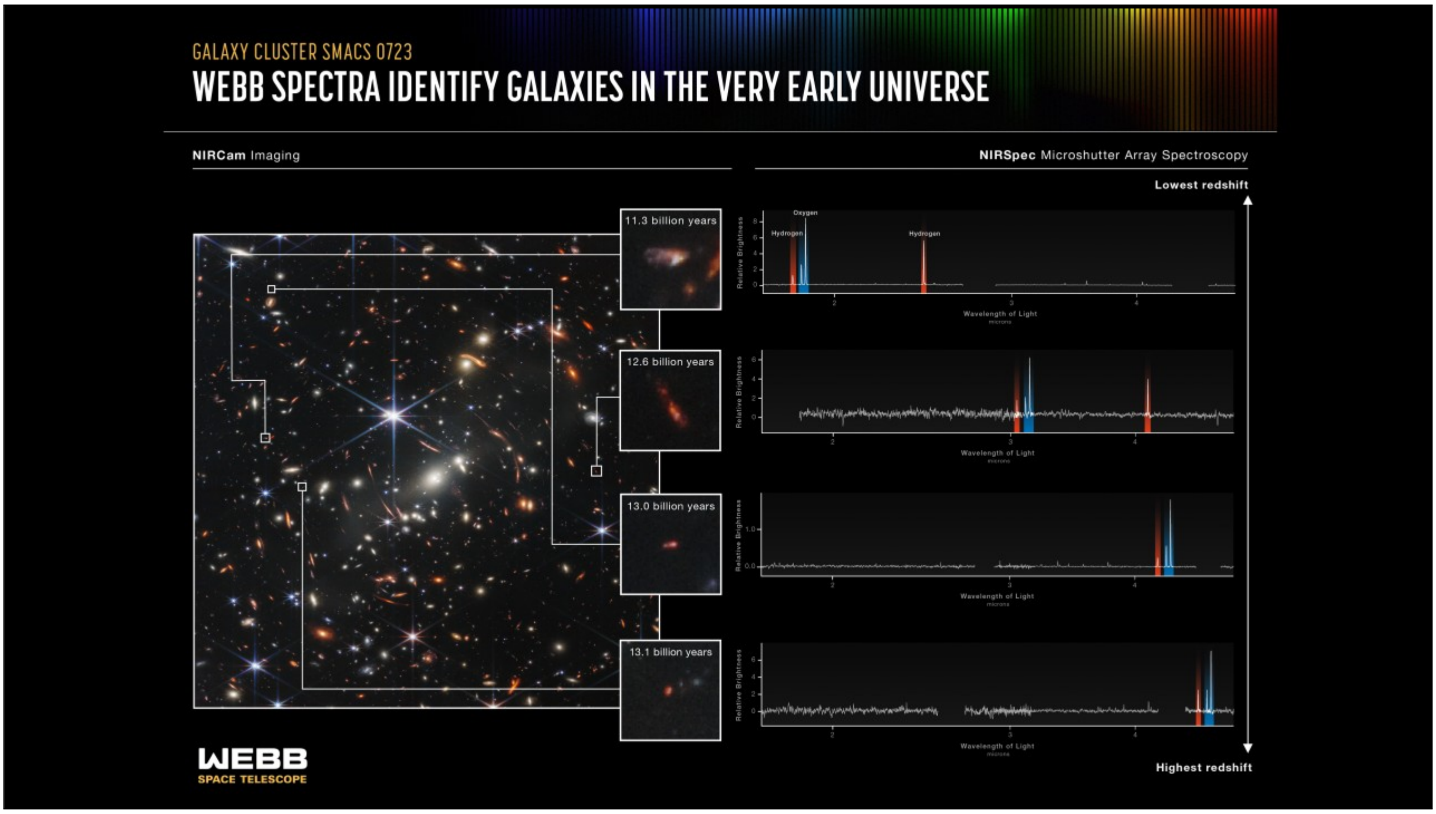
The Big Reveal: Webb's First Observations

Webb's First Deep Field SMACS 0723

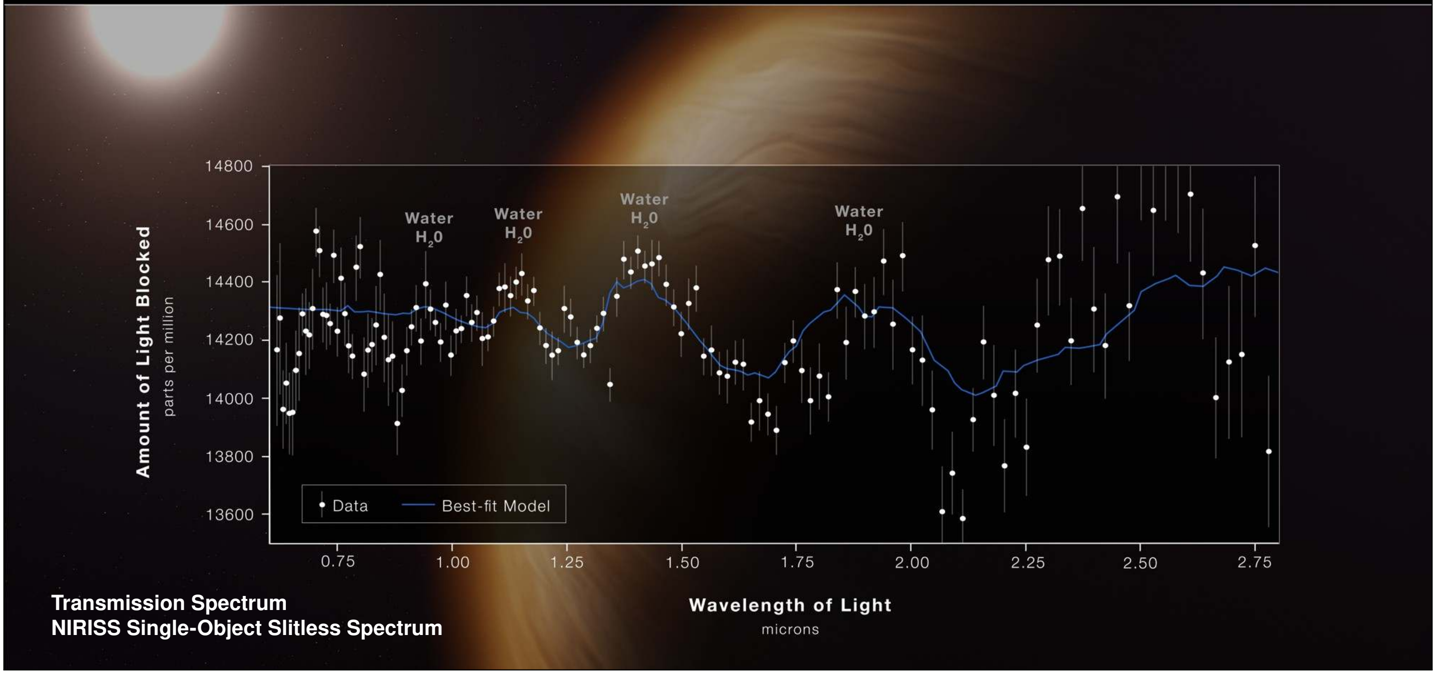


Near-Infrared Light
NIRCam Image




GALAXY CLUSTER SMACS 0723
WEBB SPECTRA IDENTIFY GALAXIES IN THE VERY EARLY UNIVERSE
NIRCam Imaging
NIRSpec Microshutter Array Spectroscopy
Lowest redshift
11.3 billion years
12.6 billion years
13.0 billion years
13.1 billion years
Hydrogen
Oxygen
Hydrogen
Relative Brightness
Wavelength of Light
Highest redshift
WEBB
SPACE TELESCOPE

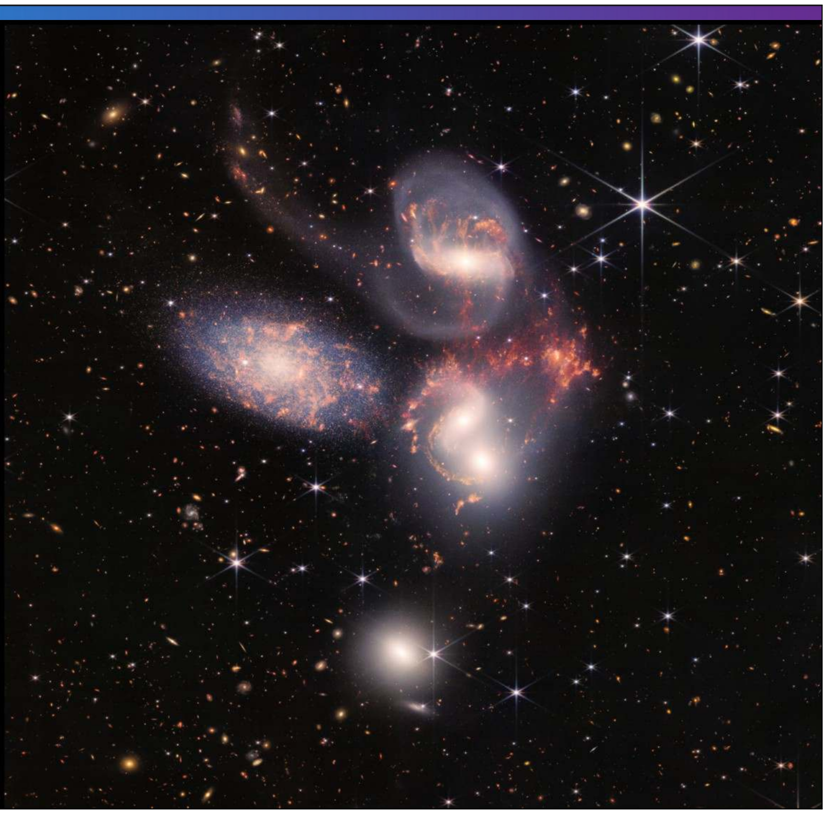
Exoplanet | WASP-96 b



Planetary Nebula | Southern Ring Nebula

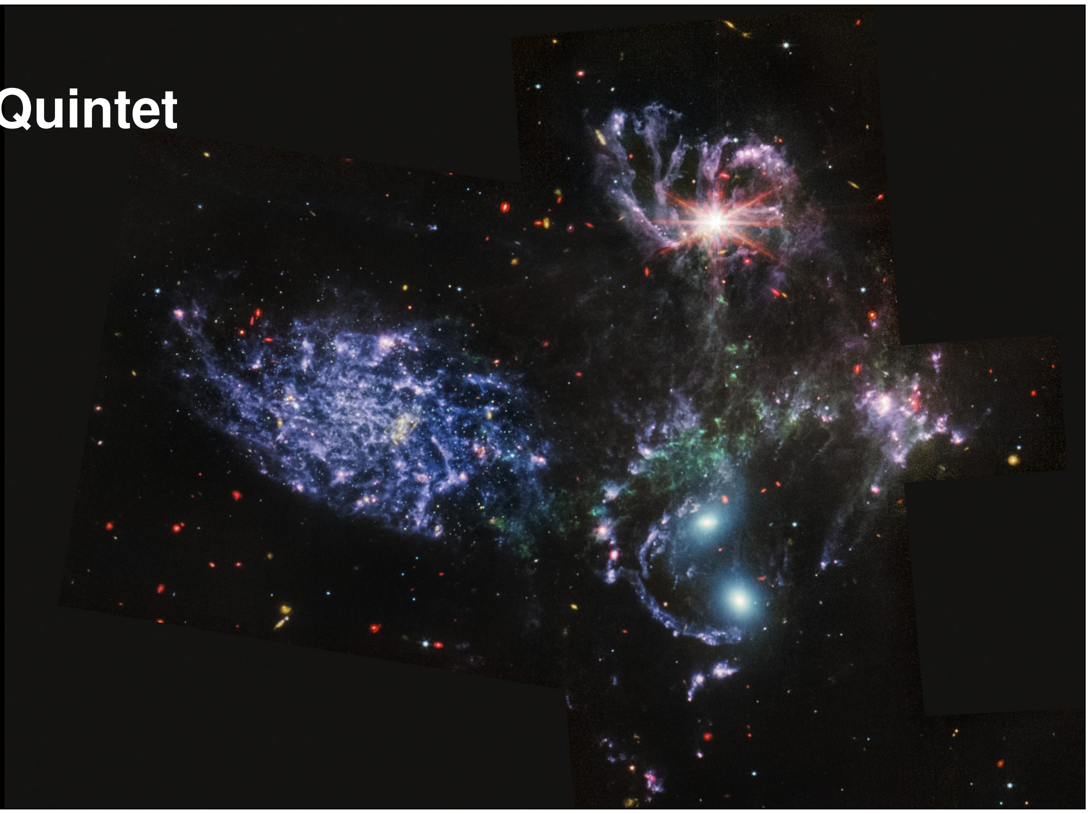
Interacting Galaxies
Stephan’s Quintet

Near- and Mid-Infrared Light
Combined NIRCam and MIRI Image



Stephan’s Quintet

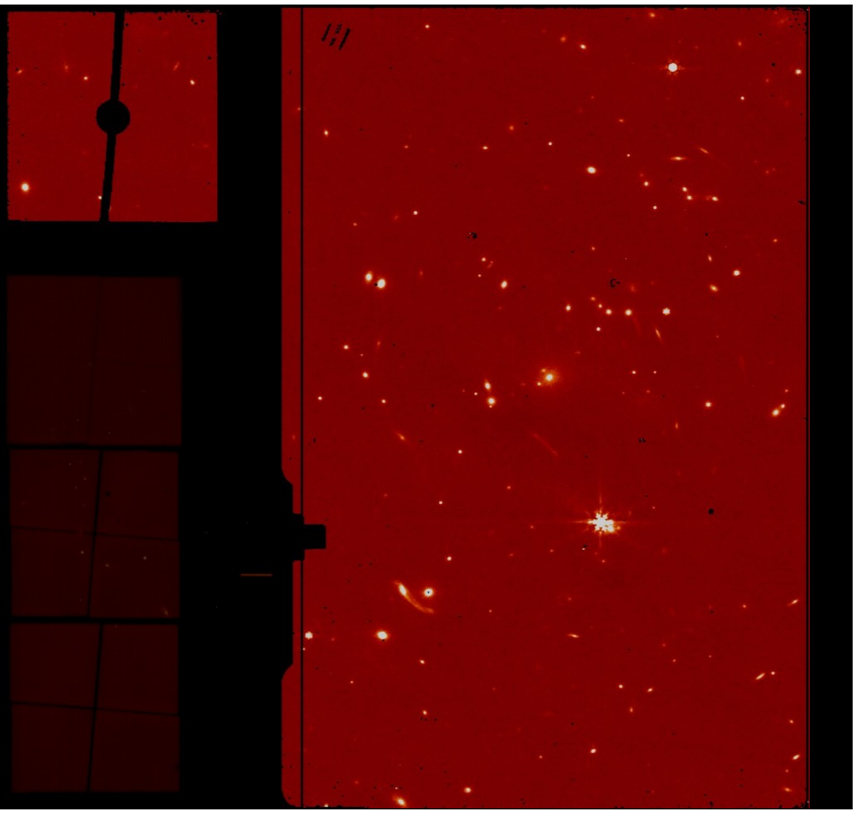
MIRI Only

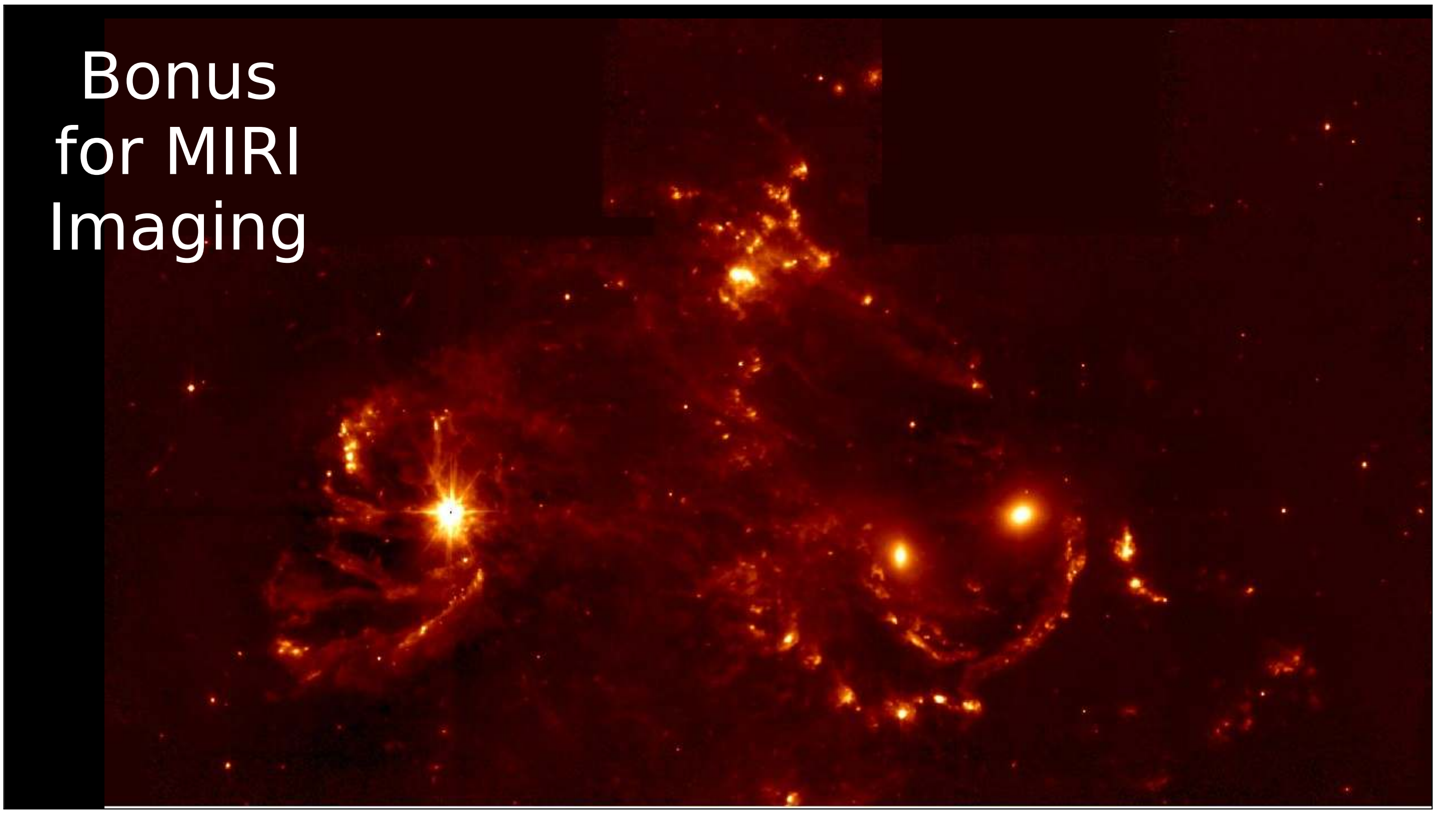


Stephan’s Quintet

Flaming
Motercycle
View

Bonus
for MIRI
Imaging




Bonus
for MIRI
Imaging


Star-Forming Region I Carina Nebula
Near-Infrared Light
NIRCam Image


NIRCam + MIRI Image


NIRCam + MIRI Image

Slides - Hands-on Session: Preparing a JWST Proposal

JWST Proposals

- Proposal details
- Exposure Time Calculator (ETC)
- Astronomers Proposal Tool (APT)

- JDox for authoritative info
- Slides for multiple sources
  - Good stuff is a credit to others
  - Mistakes are all mine

Proposal Details

JDox guide

Home / JWST Opportunities and Policies / JWST Call for Proposals for Cycle 4 / JWST Proposal Workflow

JWST Proposal Workflow

JWST Cycle 4 proposers are encouraged to follow this workflow for writing and submitting proposals for the James Webb Space Telescope (JWST).

On this page

Know the deadlines

The Cycle 4 proposal deadline is **October 16, 2024 by 8:00pm US Eastern Daylight Time**

Director's Discretionary Time proposals can be submitted at any time.

JDox for the definitive details

Proposing Opportunities

- Opportunities and Policies
- Call for Proposals for Cycle 4
  - New and Important Features
  - Proposal Workflow
  - Anonymous Proposal Reviews
  - Proposal Submission Policies
  - Proposal Categories
  - Observation Types
  - Data Rights and Duplications
  - Proposal Selection Procedures
  - Guidelines and Checklist for Proposal Preparation
  - Filling Out the APT Proposal Form
  - Preparation of the PDF Attachment
  - Proposal Implementation and Execution
  - Grant Funding and Budget Submissions
  - Appendix - Science Keywords

Home / JWST Opportunities and Policies / JWST Call for Proposals for Cycle 4

JWST Call for Proposals for Cycle 4

STScI solicits proposals for JWST Observing, Archival, and Theoretical Research. Downloadable PDF collections of these articles are provided as a courtesy, made available and updated when feasible.

ⓘ *The online documentation is the authority*, and will be updated with the latest information.

On this page

- Late breaking news
- Welcome
- Proposing calendar and deadlines
- Where to get help
- Who's responsible

Late breaking news

New information that arises during the Cycle 4 Call for Proposals will be provided here.

- Make sure that you create the PDF using the latest version of the .sty file. The .sty file was updated 09/17/2024 to use /normalsize for the figure captions. The latest update on 10/10/2024 provided further clarification regarding which headings are optional. The font of the captions will still appear slightly smaller than the text. That is fine, do not change the .sty file.
- Investigators are reminded that those who are facing extenuating and unforeseen circumstances beyond their control that will impact their ability to meet the stated deadline have the option of contacting the JWST Help Desk to request a moderate extension.

General Observer Proposals

Depending on size, GO proposals fall into the different categories:

- **Very Small Proposals** are requests of **up to 20 hours**. These proposals are reviewed and recommended by external panels. These proposals have a default of 12 months of exclusive access rights.
- **Small Proposals (20 to 50 hours)** These proposals are be reviewed and discussed by topical panels. They also have a default of 12 months of exclusive access rights.
- **Medium Proposals (50 to 130 hours)** These proposals are be reviewed and discussed by topical panels. They also have a default of 12 months of exclusive access rights.
- **Large Proposals (>130 hours)** will be reviewed by the TAC, which is the chairs panel. They have no default exclusive access period, but may request one in the proposal; that request should be justified in the "Special Requirements" section of the proposal and will be subject to TAC review.

General Observer Proposals

- **Treasury Programs** are designed to create datasets of lasting value to the mission, by solving multiple scientific problems while simultaneously enabling a variety of compelling investigations. They should also provide scientific products that go beyond what will be produced by the JWST calibration pipeline. There is no size limit— proposals can be both Large and Treasury. Treasury status programs have no exclusive access periods..

- **Long Term Programs** scientifically require observing time to be split over more than one cycle to accomplish science goals. They may request up to 3 cycles. They should describe the entire requested program and provide a cycle-by-cycle breakdown of the number of hours requested. The sum of all hours requested in Cycles 2, 3, and 4 determines whether a Long-Term Proposal is Small, Medium, or Large.

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General Observer Proposals

- **Joint Observing Programs** STScI has reached agreements with several other observing facilities (ALMA, Chandra, HST, NASA-Keck, NOIRLab, XMM-Newton) to award time for joint programs in which JWST science is the prime science, but multi-wavelength observations from another ancillary observatory are critical for the science goals of the proposal. Joint programs may be for any amount of JWST time. The only criterion above and beyond the usual review criteria is that both sets of data of the same target(s) are required to meet the primary science goals.
- **Calibration Proposals** STScI manages calibration data and software for all observatory modes, but not all JWST configurations. However, STScI does not have the resources to calibrate fully all potential capabilities of all instruments. Additionally, the astronomical community has expressed interest in receiving support to perform calibrations for certain uncalibrated or poorly calibrated modes, or to develop specialized software for certain JWST calibrations. In recognition of this, STScI is encouraging users to submit Calibration Proposals, which aim to fill gaps in the calibration of JWST and its instruments.
- **Survey programs** improve the efficiency of JWST by providing short, schedule-filling observations when gaps are identified. Analogous to the HST-Snapshots, filling targets will be drawn from these lists with no guarantee any will be observed.

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GO Special Observation Types

- **Solar System objects observations** are limited due to the limited field of regard. The Sun, Mercury, Venus, Earth, and Moon cannot be observed due to the orientation of the sunshade.
- **Target of Opportunity (ToO)** observations are of transient phenomena that occur at unexpected times and locations. These programs are activated when alerted by the Principal Investigator (PI). Due to limits in inserting them into schedule, and effects on efficiency, ToOs are classified as disruptive (turnaround less than 14 days) or ultradisruptive (turnaround less than 3 days). The latter incur an additional 45 minutes of overhead per activation. Observers should checkout the latest Call for Proposal for additional details such as expected number of approved ToO.
- **Time Constrained observations** require execution within a constrained time period, e.g., observations of specific phases of variable stars, exoplanet transits, and some solar system phenomena.
- **Time Critical observations** are those that require an activation at a precise time, specified to within a window of 1 hour. These observations carry an overhead of 60 minutes per activation.

GO Special Observation Types

- Science parallel observations involve simultaneous operations of two instruments to increase science return.
  - Coordinated parallels are defined within a single program, to achieve complementary observations. Coordinated parallels use pre-defined APT templates.
  - Pure parallels involve separate, distinct programs, not necessarily with the complementary goals.

Coordinated versus Pure Parallels

Coordinated Parallels	Pure Parallels
Science case in proposal needs to **justify parallel as well as prime observations**. Science goals need to call for both.	Distinct proposal type, **using parallel slots derived from separate (primary) progr**ams.
Proposer can **craft exposure times, number of exposure specifications, dithers, etc**. to make things work for their science with the **prime and parallel** observations.	Pure parallel observations **cannot change the properties of primary observations** to which the proposed parallel ones will be attached.
Coordinated parallel proposal **specifies all parallel exposures in detail**.	• Proposal specifies one **Observation per type of proposed exposure** (e.g., different filters or grisms). • **Exposure times need to specify the minimum allowable lengths** for the proposed science. • Scientific Justification needs to **specify minimum number of distinct primary targets per observation to fulfill science goals.**
APT templates for coordinated parallels are based on the **"normal" templates** of the prime observing modes.	APT templates for pure parallels are **distinct from the "normal" observing templates**, selected in Proposal Information section of APT.

Director's Discretionary Proposals

- Nominally, up to **10% of the available JWST** time in any cycle may be reserved for Director's Discretionary (DD) time allocations.
- DD proposals allow the timely follow-up of transient phenomena or other new discoveries that could not have been plausibly proposed for in response to the Cycle call.
- Submission of DD proposals will be accepted at any time during the ongoing Cycle.
- DD proposals have **zero proprietary time**.

Archival Proposals

- Observations that are no longer in the exclusive access periods are freely available for science exploitation. This is where the archival research programs come in.
- The JWST Archival Research (AR) Program can provide financial support for the analysis of such datasets.

The categories of Archival Proposals are:

- Regular AR Proposals
- Legacy AR Proposals
- Calibration AR Proposals
- AR Theory Proposals
- AR Cloud Computing Studies
- AR Data Science Software Proposals

STScI encourages the submission of AR Proposals that combine JWST data with data from other space-missions or ground-based observatories, especially those data contained in the Mikulski Archive for Space Telescopes (MAST).

Dual Anonymous Proposals

- STScI uses a **dual anonymous proposal review** for both JWST and HST.
- The identity of proposers are not known to reviewers in the process of scientific ranking.
- This requires thought in crafting proposals.
- Now let’s see some tips on proposal writing.

Dual Anonymous Tips

- Proposers must **craft their PDFs** (scientific justification and description of observations) **to be anonymous.**
- They must **exclude names and affiliations of the proposing team**, including in figures and references to personal websites.
- They must **not claim ownership of past work**, e.g., "my successful HST program (GO-######)..." or "Our analysis shown in Doe et al. 2012..."
- Rather, **they should cite references in passive third person**, e.g., "The HST program GO-##### did...", or "Analysis shown by Doe et al. 2012...". This includes references to proprietary data and software.
- They **must describe the work proposed**, e.g., "We propose to do the following..." or "We will measure the effects of..."

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Dual Anonymous Tips

- Proposals that have egregiously violated these rules are flagged for disqualification. In the Cycle 2 call eight proposals were rejected for non-compliance and excluded from discussion and statistics
- Less serious cases (a stray "we" or "our") are also pointed out. Panelists are encouraged attempt to ignore these less flagrant errors whenever possible, and keep focused on the scientific merits.
- Cases that are too difficult to ignore (levelers could be important in making that decision), or not sufficiently anonymized, are commented on in the recommendations to the Director, and may be disqualified.
- Panelists also provide specific feedback in their comments to proposers if a proposal was not sufficiently made anonymous.

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Dual Anonymous Tips

- Proposals are evaluated solely on the scientific merit of what's proposed
- Panelists are instructed not to spend any time attempting to identify the PI or the team
    - They are instructed to discuss the science and not the people.
- Levelers are present in each room to help insure guidelines are respected.
- **Language IS very important.** Utilize the appropriately neutral pronouns (e.g.,"what they propose", or "the team has evaluated data from a HST Cycle 25 program").
- The topic panels are broad in expertise.
- Small and medium proposal need to be written with a "broad" appeal.
- Large and Treasury are reviewed by the TAC, which is a multi-discipline committee (Solar System to Cosmology).
- It is especially important to convey the significance of the science case to TAC members who might be experts in a different topic.

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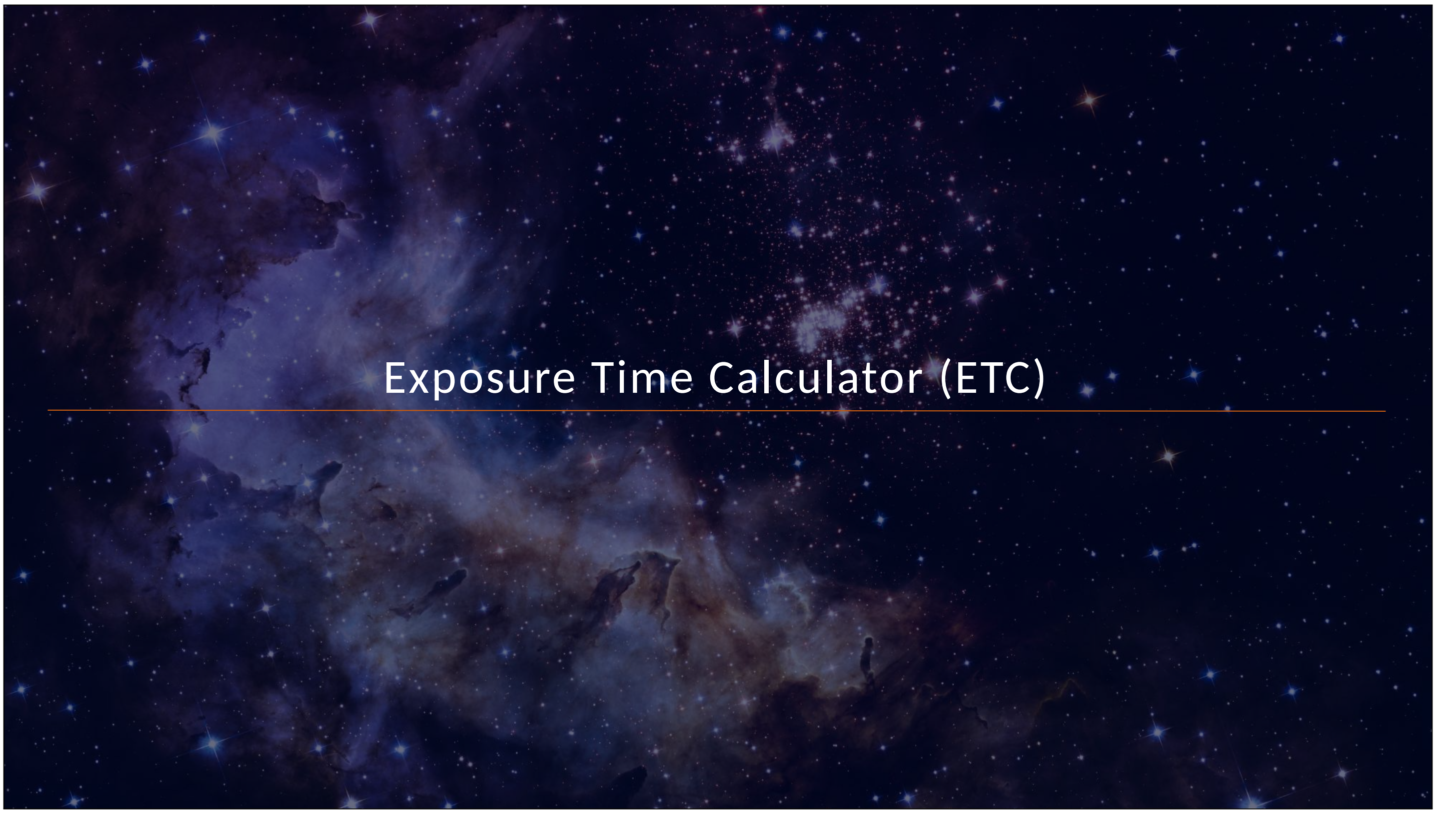

First things first – where can I find the ETC?

jwst.etc.stsci.edu

Welcome to the JWST Exposure Time Calculator

Quick Start | Create User | Login | Work Anonymously

News

Welcome to version 1.5 of the JWST ETC!

This release features new instrument modes, accuracy improvements, usability enhancements, and more: see the Release Notes for details, and be sure to review the Known Issues for this release.

When you log in to the 1.5 ETC, your old workbooks will be marked "Out of Date":

- When you load them, they will open in Read-Only mode: this ensures that your previous results are not overwritten and remain available to you for reference.
- If you copy an out of date workbook, and load the copy, all its calculations will be automatically updated for you with the current version of the software.
- For more information, see ETC Releases and Out-of-Date Workbooks.

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Some history

- Imaging
  - NIRCam SW+LW, NIRISS, MIRI
- Slit spectroscopy
  - NIRSpec FS, MIRI LRS
- IFU spectroscopy
  - NIRSpec IFU, MIRI MRS
- Multi-object spectroscopy
  - NIRSpec MSA
- Slitless spectroscopy
  - NIRISS WFSS, NIRCam WFSS
- Time Series Observations
  - MIRI LRS, NIRISS SOSS, NIRCam grism+weak lens
- Coronagraphy
  - NIRCam spots + wedges, MIRI Lyot, MIRI 4QPMs
- Aperture Masking Interferometry
  - NIRISS AMI
- Target Acquisition
  - All instruments

- The JWST ETC is required to support all science modes and related target acquisition.
- Originally, it was envisioned that the JWST ETC would be similar to the HST ETC.
- It became clear that using the HST ETC as a basic design was not viable.
- Works ok for imaging, but not for:
  - the advanced JWST modes
  - JWST detector noise / non-destructive readout
  - Supporting modern user interaction and collaborations
- Something more modern was needed.

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the “pandeia” project

3D ETC engine
(pandeia.engine)

Reference database
(pandeia_data)

- Throughputs
- Detector noise
- PSFs

…

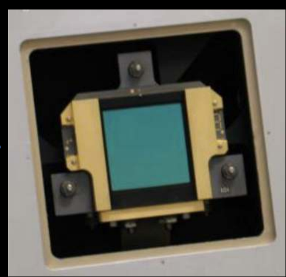
Web Application
(jwst.etc.stsci.edu)

- User interface
- Collaborative functionality

JWST Background Model

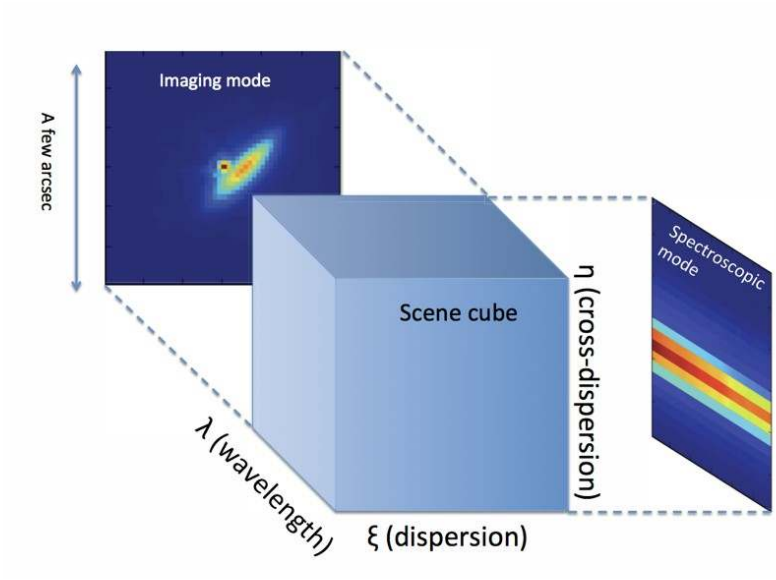
Also available via jwst_backgrounds

Engine algorithm: Overview



Engine algorithm: The scene cube

1. Create astrophysical scene
   - Abstract cube in surface brightness
   - Jy/sq. arcsec (wavelength)
2. Sample scene in angular and wavelength space
   - Conserve flux, resolve lines, a oversample JWST resolution
   - Point sources centered in mini 2x2 pixel grids.
   - Jy/sq. arcsec (wavelength)
3. Convolve each wavelength plane with ***monochromatic*** PSF
   - PSF shape is color-dependent!
   - Jy/sq. arcsec (wavelength)



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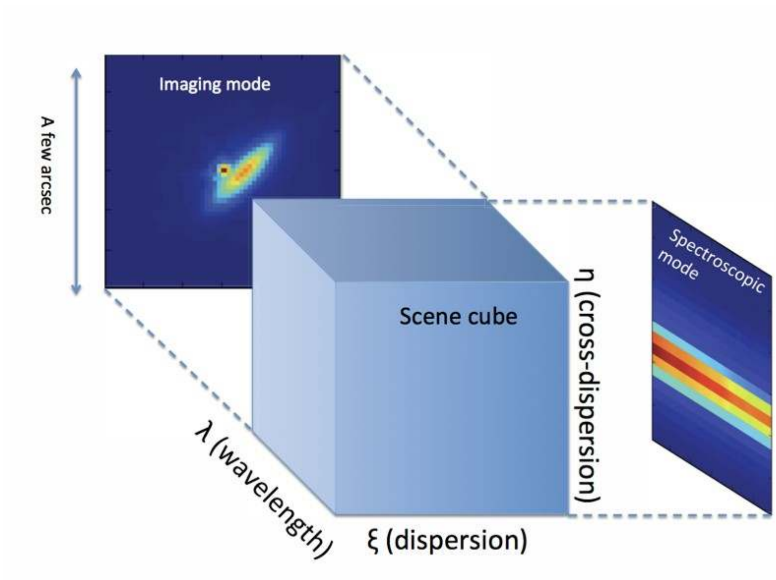
Engine algorithm: The scene cube

4. Multiply by telescope throughput and convert to a photon rate
   - Photons/s/sq. arcsec/micron (wavelength)
5. Multiply by instrument throughput + detector quantum efficiency (QE)
   - Depending on filter/disperser
   - Electrons/s/sq. arcsec/micron (wavelength)
6. Project cube onto rate image (more on this later)
   - Electrons/s/pixel



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Engine algorithm: Scene projections

Imaging projection

$$F(x, y) = \int S_\lambda^{\text{rate}}(\xi, \eta, \lambda) d\lambda \quad \text{[electrons/s/pixel]}$$

Spectral projection

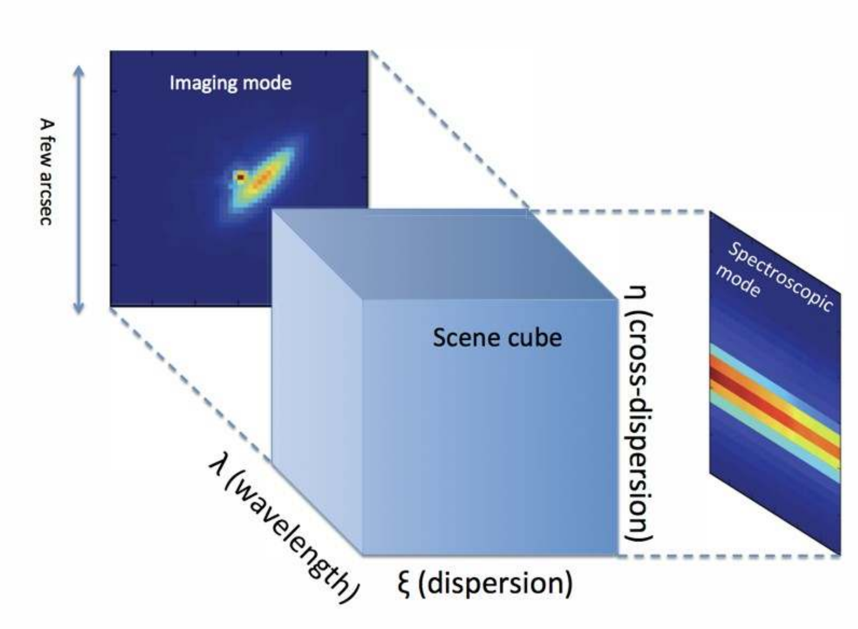
$$F(\lambda, y) = \frac{d\lambda}{dx} \int S_\lambda^{\text{rate}} \times M_{\text{slit}}(\xi, \eta) d\xi$$
$$= \frac{d\lambda}{dx} \Sigma_i S_\lambda^{\text{rate}} \times M_{\text{slit}}(\xi_i, \eta_j) \quad \text{[electrons/s/pixel]}$$

Slitless projection

$$F(x, y) = \int S_\lambda^{\text{rate}}(\xi(x, y, \lambda), \eta(x, y), \lambda) \sqrt{\left(\frac{d\xi}{d\lambda}\right)^2 + 1 d\lambda}$$

Engine algorithm: The detector level

7. Apply MULTIACCUM noise formula to the rate image.
   - Creates a noise image
   - Standard deviation in Electrons/s/pixel
8. Extract photometry or 1D spectra by applying linear noise propagation
   - Use both rate and noise image
   - Dimensionless signal-to-noise ratio
9. Celebrate! That was a lot of work.



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ETC Strategies

- A **strategy** is a prescription for how to go from a detector image to an extracted product.
- Strategies can be
  - Aperture photometry
  - Aperture spectral extraction
  - IFU extraction with a background observation ("nod off scene")
  - Coronagraphic contrast'
  - …
- Strategies are implemented as classical error propagation.

Total flux rate in measurement

Flux rate in pixel i

$$F_{tot} = \sum_i a_i F_i$$

scalar weight of pixel i

$$\sigma^2(F_{tot}) = \bar{a}\bar{C}\bar{a}^T$$

Variance of measurement

covariance matrix of pixels (1,2,…,N)

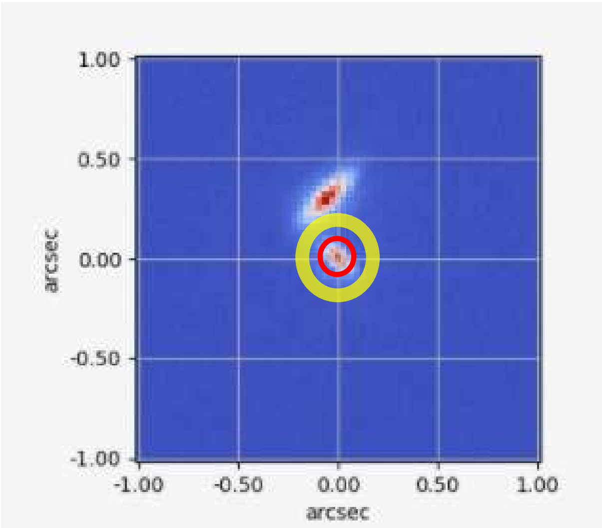
Strategy example: Imaging aperture photometry

$$F = K \sum_i^{N_A} \left(F_i^{aperture} - \frac{1}{N_B} \sum_j^{N_B} F_j^{background} \right)$$

$$a_i = \begin{cases} K, & i \in A \\ -K N_A / N_B, & i \in B \end{cases}$$

In the ETC, **"noiseless background"** means that the background term is 0. That is, the background level is "magically" perfectly subtracted.

Perform Background Subtraction Using	◉ background region
	○ noiseless sky background

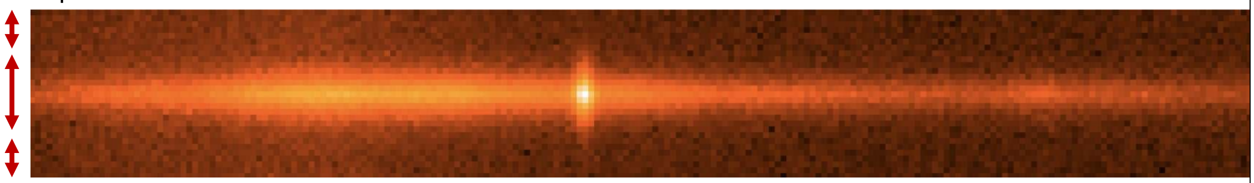


Note that the apertures are not currently drawn in the ETC

Spectroscopic strategies

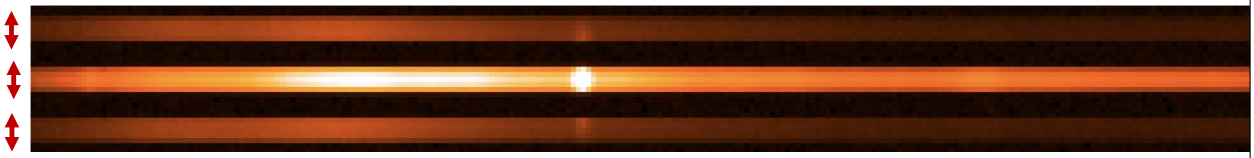
Aperture extraction / fixed slit

2 x half-height



Full shutter extraction / -2,0,2 shutter pattern

Defined by shutter height



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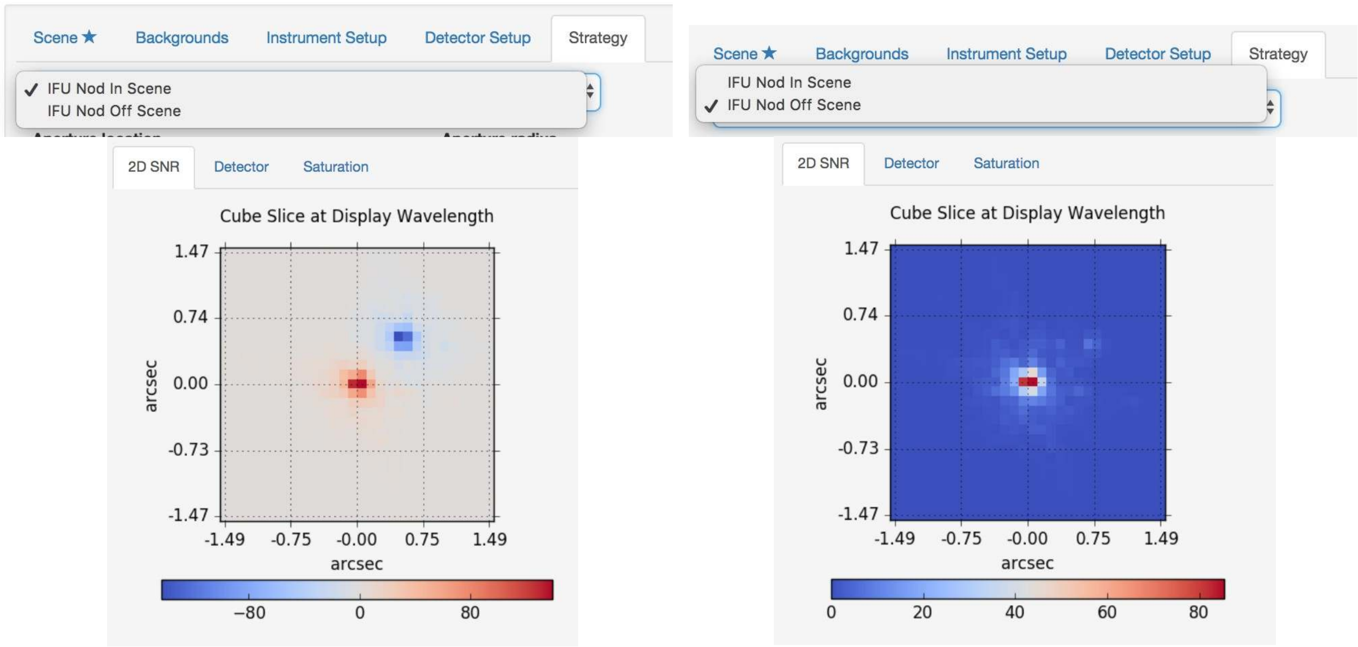
Multi-dither strategies – IFUs and coronagraphy



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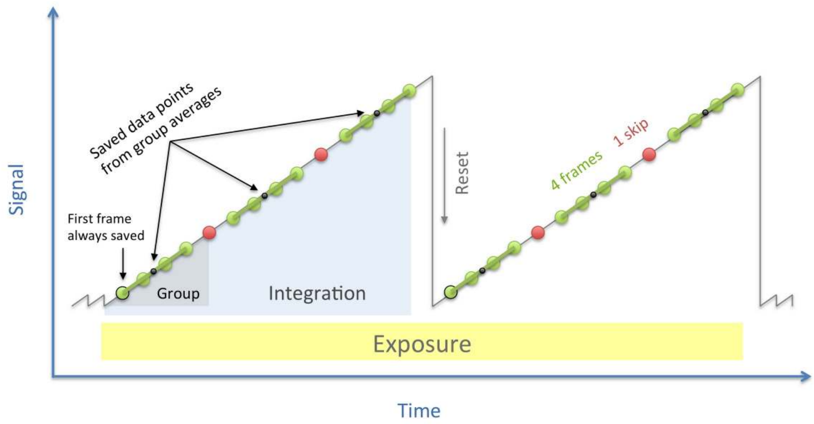
Frames, groups, integrations, and exposures

- **Subarray** = the window on the detector that is being read out
- **Frame** = one complete read of the detector or subarray
- **Group** = a set of consecutive frames that are averaged (some may be skipped)
- **Integration** = one non-destructive ramp
- **Exposure** = a set of consecutive integrations at the same pointing
- **Dither** = an exposure at a new pointing

The combination of readout pattern, ngroups, nints, nexps is called "Detector Setup"



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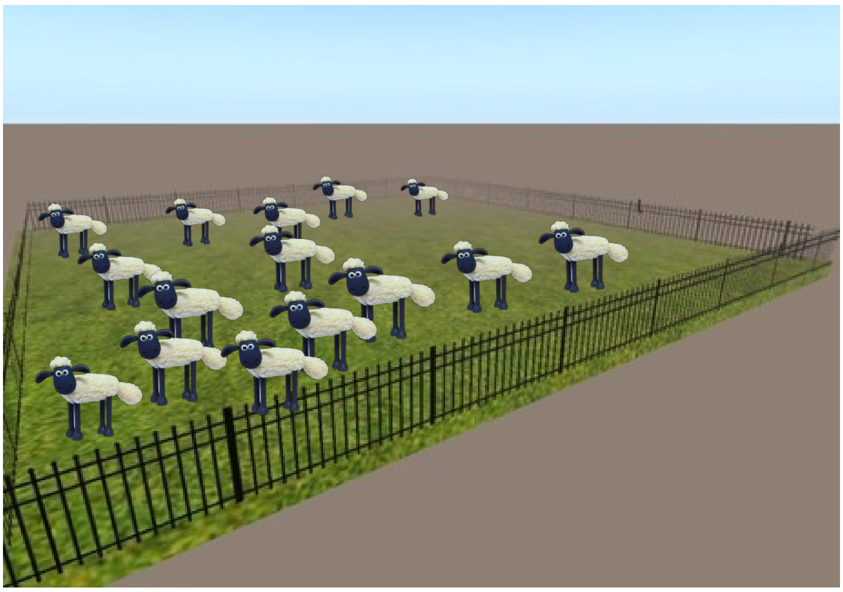
Why use MULTIACCUM non-destructive readout



- **When you count the same sheep multiple times, you reduce the read noise.**
- **Some sheep are correlated.**

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MULTIACCUM: Now with math

$$Var\left[S_{total}\right]=\frac{6}{5}\frac{\left(n^2+1\right)\left(n-1\right)}{n\left(n+1\right)}bt_g\left[1-\frac{5}{3}\frac{m^2-1}{m\left(n^2+1\right)}\frac{t_f}{t_g}\right]+12\frac{\left(n-1\right)}{mn\left(n+1\right)}\sigma_{ron}{}^2 \qquad (36)$$

$\uparrow$

Variance of slope

Robberto 2009

m = Number of frames per group

n = Number of groups per integration

Take-home message:
The read noise decreases as the root of the number of frames per integration (m*n)

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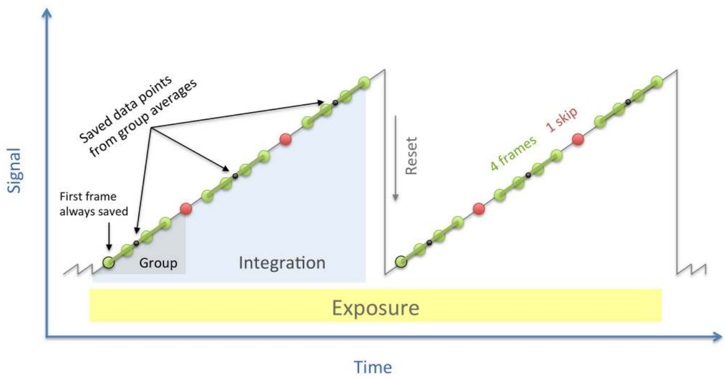
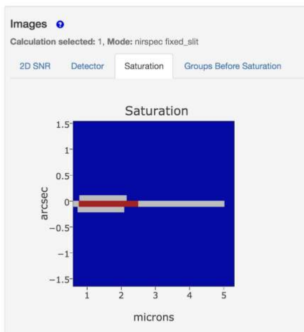
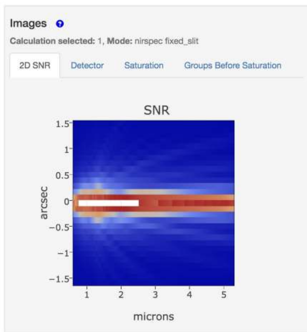
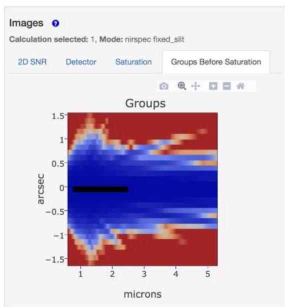
How is saturation treated in the ETC?









Two types of saturation:

- **Partial saturation** - the integration saturates before it completes, but more than the minimum number of groups are unsaturated.
- **Full saturation** – the integration saturates before the minimum number of groups is reached.
- The minimum ngroups is usually 2.

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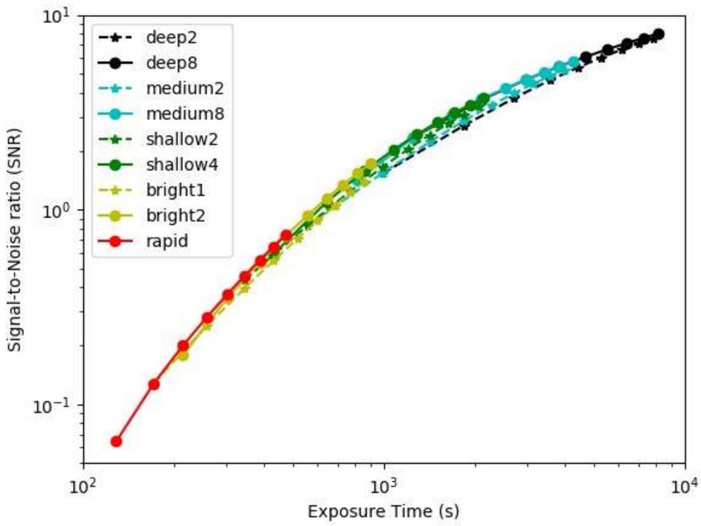
Finding the best exposure parameters

Selecting the optimal combination of readout pattern, ngroups, nints and nexps is a trade-off.

- ➢ More frames decreases read noise.
- ➢ Shorter groups increases data volume.
- ➢ Longer groups increases the chance of a cosmic ray hit during the group.
- ➢ Shorter groups/longer integrations make cosmic ray corrections better.
- ➢ Shorter integrations make ramp fits more uncertain in the presence of non-linearity.
- ➢ More dithered exposures decreases flat field errors.
  - Note: In the ETC all exposures are assumed to be dithered, except for time-series observations.
- ➢ Patterns that skip a lot of frames have higher read noise, but have slightly better duty cycle.



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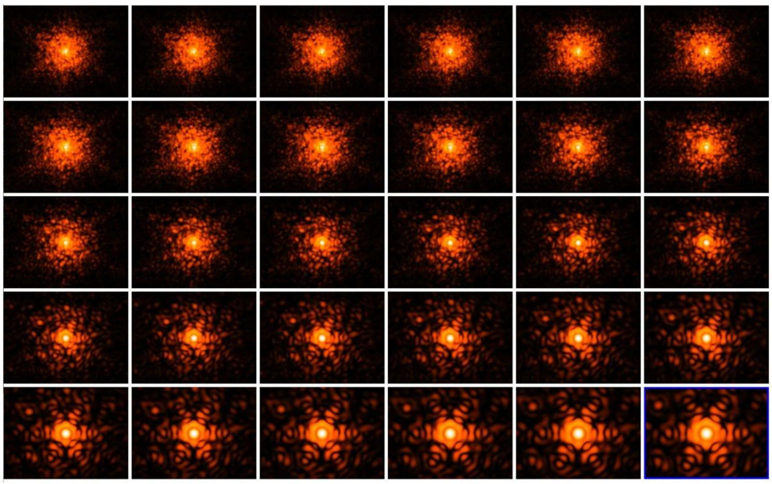
PSF library

- Uses WebbPSF to calculate point spread functions including realistic wavefront errors.
- Almost 5000 individual monochromatic PSFs.
- Subsampled by integer factor of pixel size.

NIRCam SW PSFs (0.6-5.2 micron)



Fun fact: The observed PSF depends on the color of the astronomical source.

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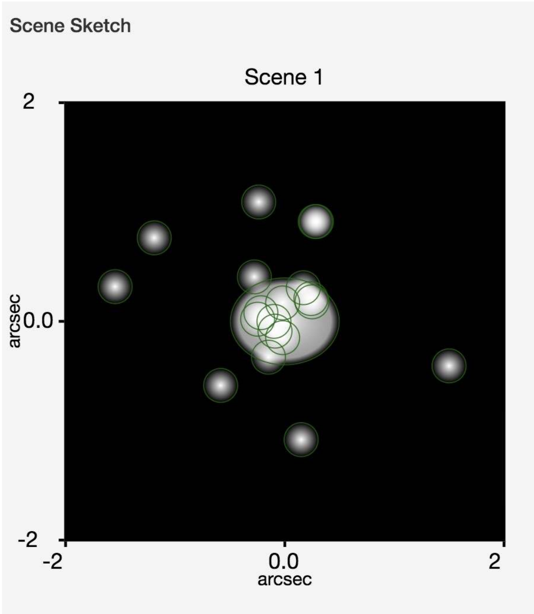
Scenes and sources

- Source definition
  - Spectrum
    - Continuum
    - Renormalization (units of integrated flux density or surface brightness)
    - Lines (center, width, flux)
  - Shape
    - point source or extended
    - Flat, Gaussian, Sersic, power law
- Scene definition
  - List of sources
  - X,Y offset
  - Orientation(for extended sources)
  - The same source can exist in multiple scenes!



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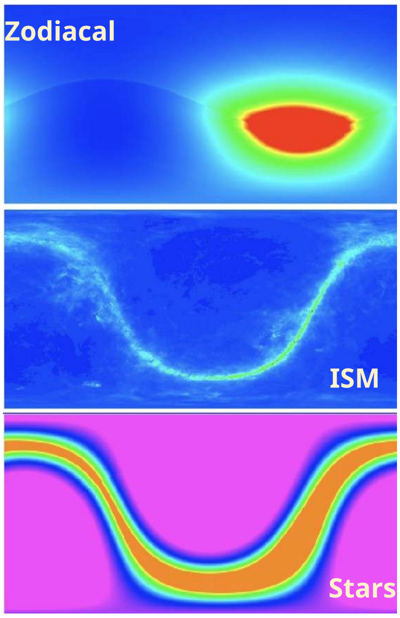
The JWST Background Model

- JWST uses a dynamic "background model generator" (BMG)
- Components of the background are:
  - Galactic interstellar medium+stars
  - Zodiacal light (position+time dependent)
  - Out-of-field stray light (position+time dependent)
  - Telescope+spacecraft thermal emission
- Two ways to use backgrounds in the ETC:
  - **"Dated background":** The actual background for a given RA, Dec, and date.
  - **"Dateless background":** Given RA, Dec, the low (10%), medium (50%), or high (90%) percentile of the background range over a full year.



A. Noriega-Crespo

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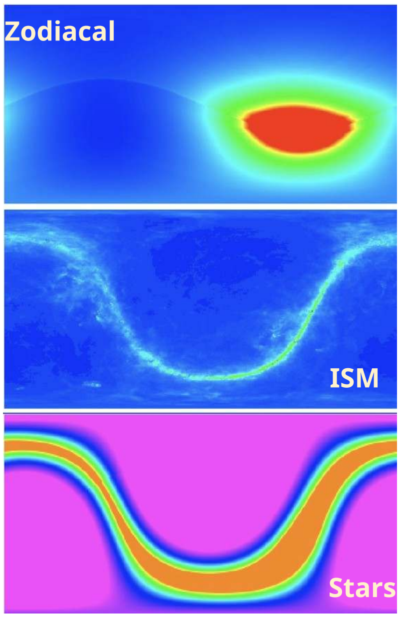
Zodiacal and Galactic backgrounds

- Zodi+ISM heritage from Spitzer's operational system (IPAC)
  - Data are from COBE/DIRBE
  - ISM "cirrus" uses fixed spectrum, including PAHs. Intensity set by Schlegel et al. extinction maps, which were fits to IRAS + DIRBE/COBE data
  - Wainscoat et al. 1998 star counts model

Fun fact: Benchmark sensitivities computed for (J2000, 17:26:44 -73:19:56) on June 19.



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Thermal self-emission

- Thermal emission from JWST itself is the dominant background at ~>15um.
- Sum of 20 blackbodies (P. Lightsey, J. Rigby).
- Produces backgrounds of 0.74 and 174 MJy/SR at 10 and 20 micron. (Reqs. are 3.9 and 200 MJy/sr). Temperatures are as expected: T(sun shield)=89K, T(primary mirror)=54K (hottest segments).
- Blackbody model agrees with Lightsey calculations at 15, 25 micron to within 0.5%.

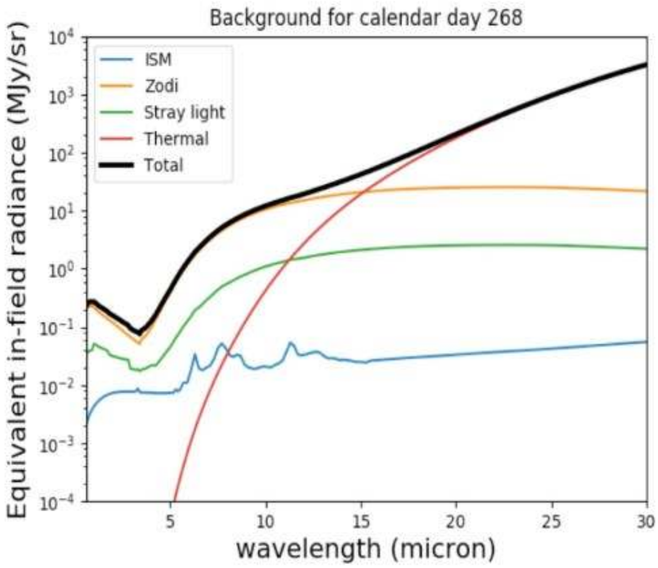

Figure from J. Rigby

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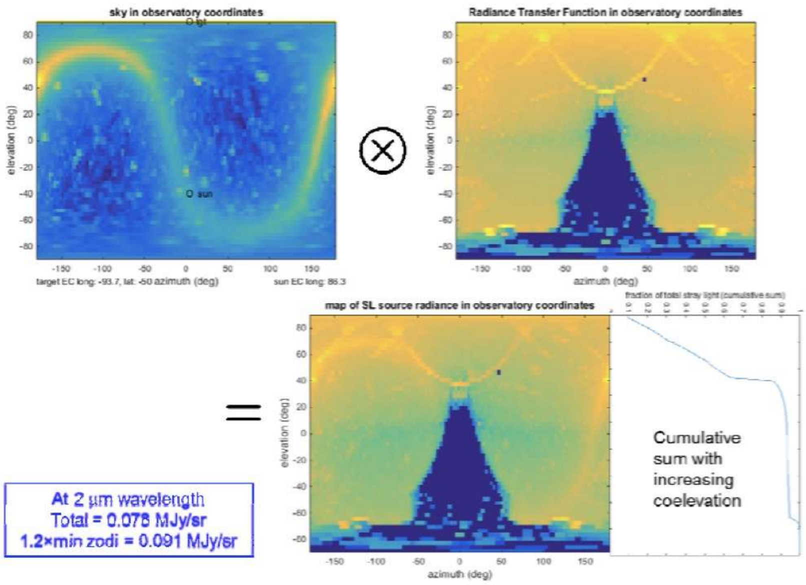
Stray light

- The background model calculates the stray light for a given position and date, following Lightsey 2016 SPIE.
- Radiance Transfer Functions (RTFs) from Lightsey, at 0.7, 1, 2, 3, 5, 10, 15 micron.
- Sky map from Galactic + Zody engine (for that position, for that date)
- Interpolate RTFs at other wavelengths.



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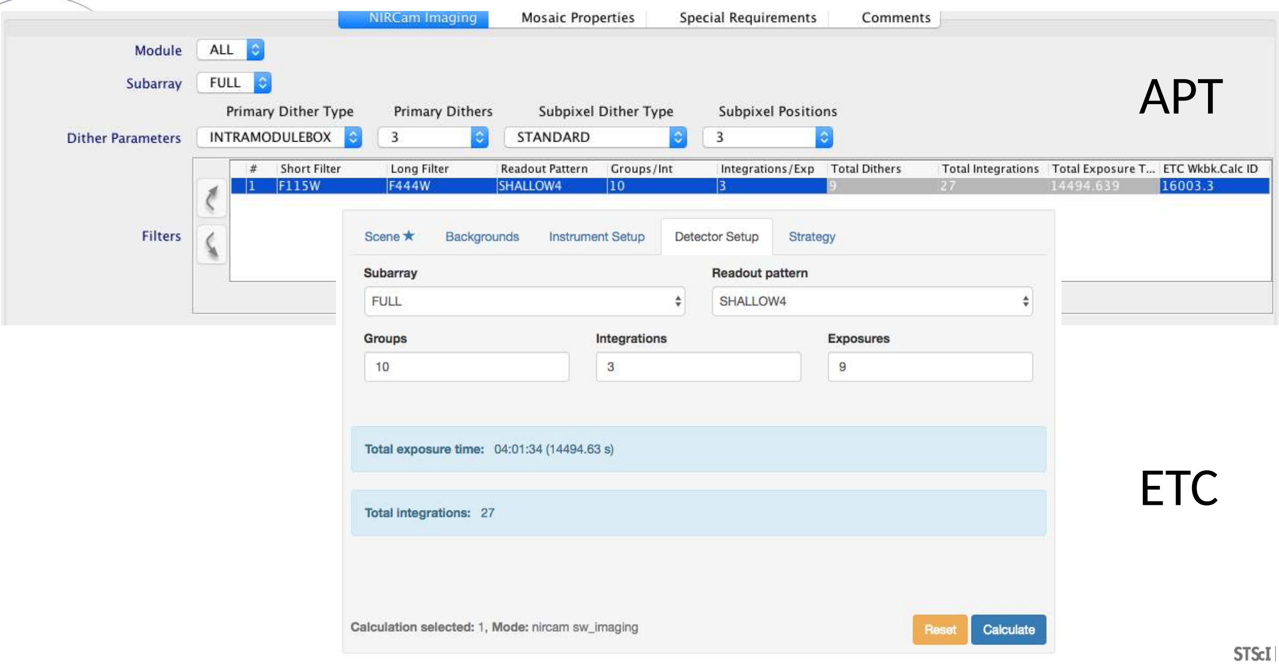
How to use the ETC with APT



APT

ETC

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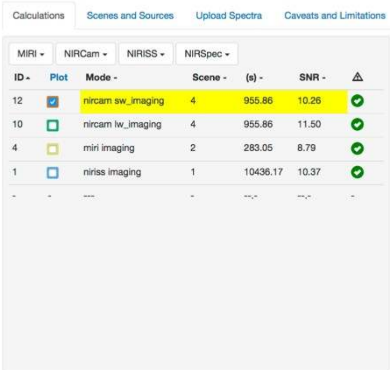
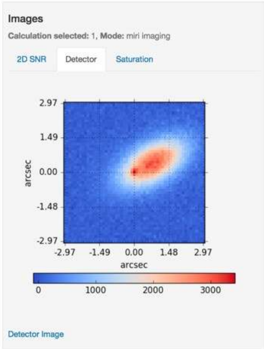
The ETC web application: A collaborative work environment





- Workbooks: Organize and save your ETC calculations
- Build your own sources and scenes library
- Analyze and compare different instruments and modes
- Share your work with your team

ETC engine available as a Python module

- Python module
- More functionality than available in the web application
- Advanced scripting
  - Parameter space exploration
  - Complex scenes / many sources
  - Any JWST science mode accessible within one framework
- pip install pandeia.engine
- https://pypi.org/project/pandeia.engine/

All throughputs available through the pandeia engine

```
import numpy as np
from pandeia.engine.instrument_factory import InstrumentFactory

def get_pce(instrument,mode,config):

    obsmode = {
               'instrument': instrument,
               'mode': mode,
               'filter': config['filter'],
               'aperture': config['aperture'],
               'disperser': config['disperser']
               }

    conf = {'instrument': obsmode}

    i = InstrumentFactory(config=conf)
    wr = i.get_wave_range()
    wave = np.linspace(wr['wmin'], wr['wmax'], num=500)
    pce = i.get_total_eff(wave)

    return wave,pce
```

MIRI MRS photon-to-electron (PCE) conversion efficiency

Note that modes with significant pupil obstructions (like NIRISS AMI and coronagraphy) will have an additional throughput factor.

Did I do it right? Summary checklist

There are many parameters affecting the predicted ETC sensitivities.

That's the point of having a versatile tool, but comes with some responsibility.

- ✓ Think about your background subtraction strategy.
- ✓ Think about what extraction aperture is optimal (point or extended sources).
- ✓ Is your background correct for your target – enter the actual RA, DEC. Investigate time dependency.
- ✓ Check that your extraction aperture does not contain contaminating flux from other sources.
- ✓ Is your selected readout pattern giving you the best SNR?

Astronomers Proposal Tool (APT)

The JWST Astronomer's Proposal Tool

The **Astronomer's Proposal Tool (APT)** is used to specify proposed observations for JWST and submit them for consideration by the Time Allocation Committee (TAC).

- The scientific justification PDF must be attached prior to submission.

APT is also a resource estimator.

- Need a resource estimate for the TAC.
- APT uses a system of overhead charges to make this resource estimate possible.
- Units are in decimal hours.

APT Basics

Observation – basic proposal design element specified by the user.

Observation Template – GUI form filled out by the user.

- Parameters depend on selection of instrument and mode.
- Contains the exposure specifications.

Visit – set of exposures (included overheads) obtained on a single guide star without scheduling interruptions. (This is the scheduling unit.)

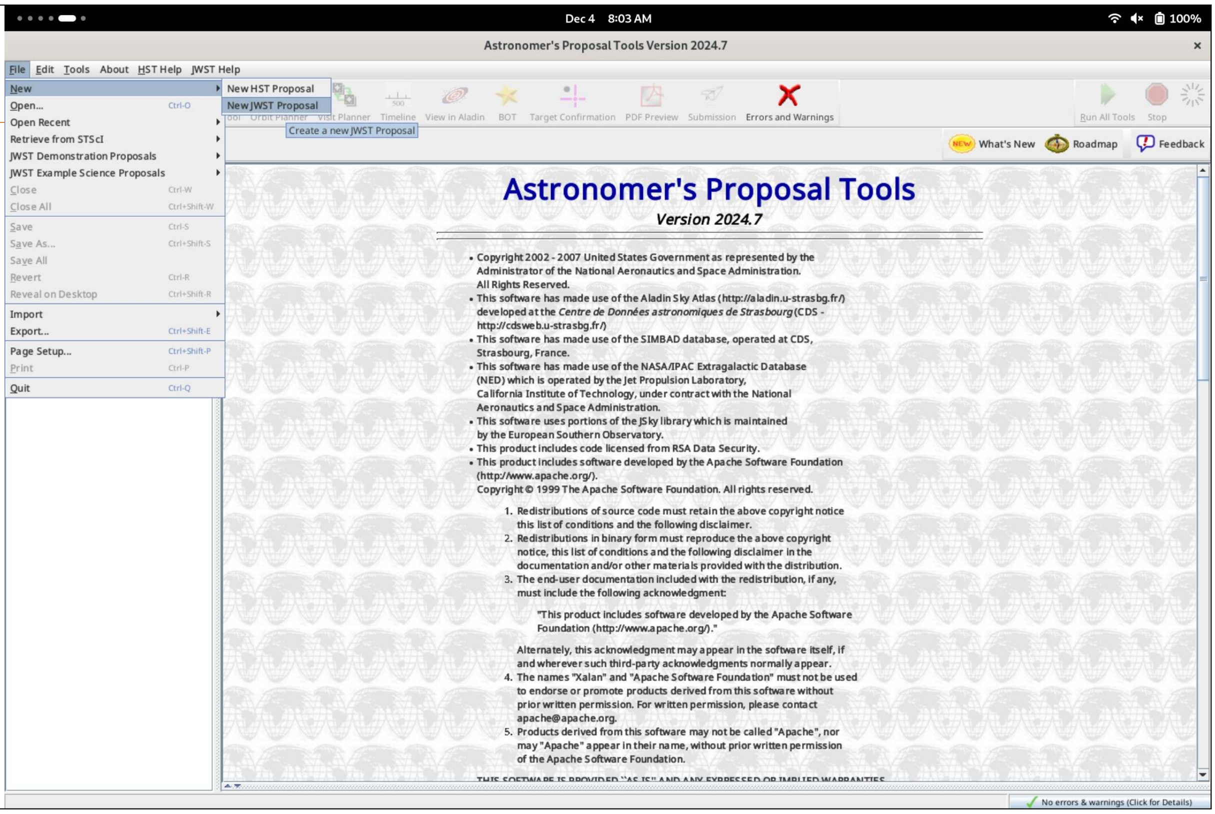
- Observations are divided into one or more visits by APT.

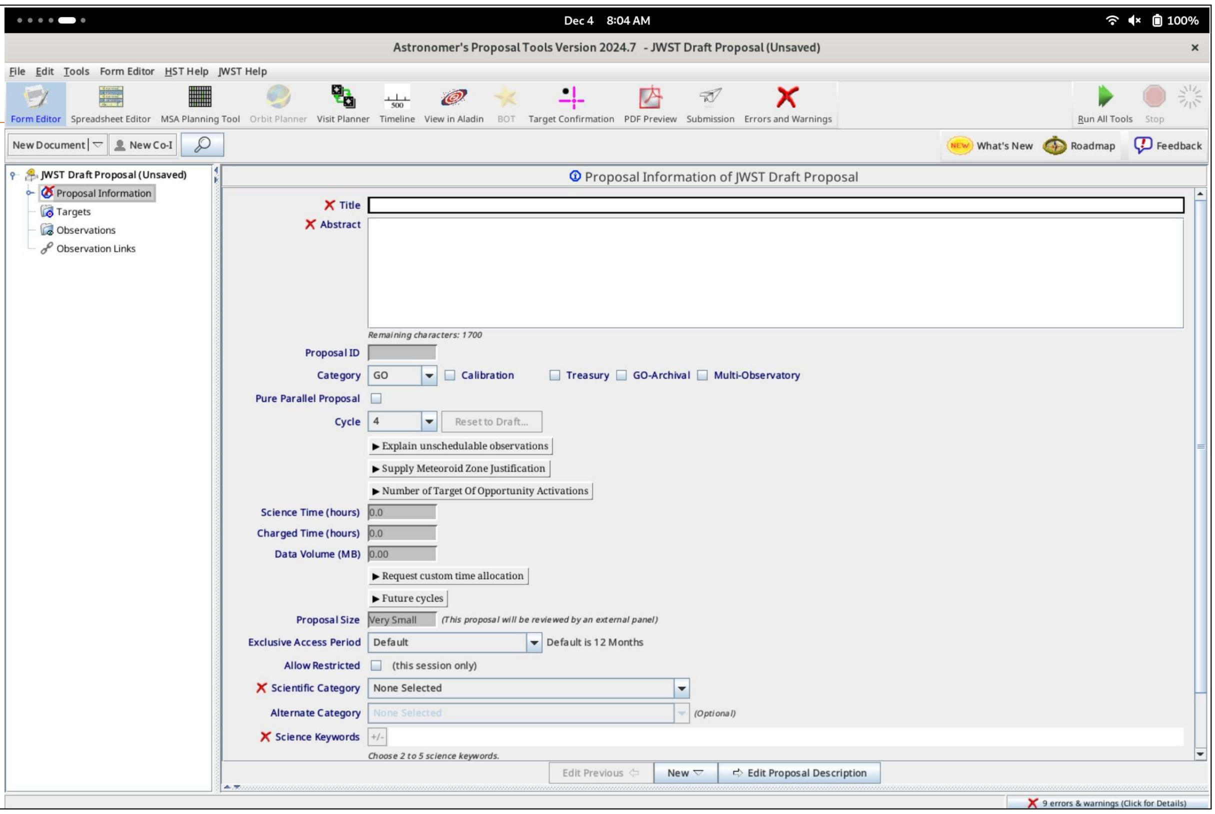
Overhead – charged time for operations activities performed by the observatory.

- **Graphical Timeline** – provides a visual display of overheads for each visit.

Visit Planner – checks the schedulability of an observation (including guide star availability).

Smart Accounting – updates the full proposal's resource estimates and remove excess overheads prior to submission.





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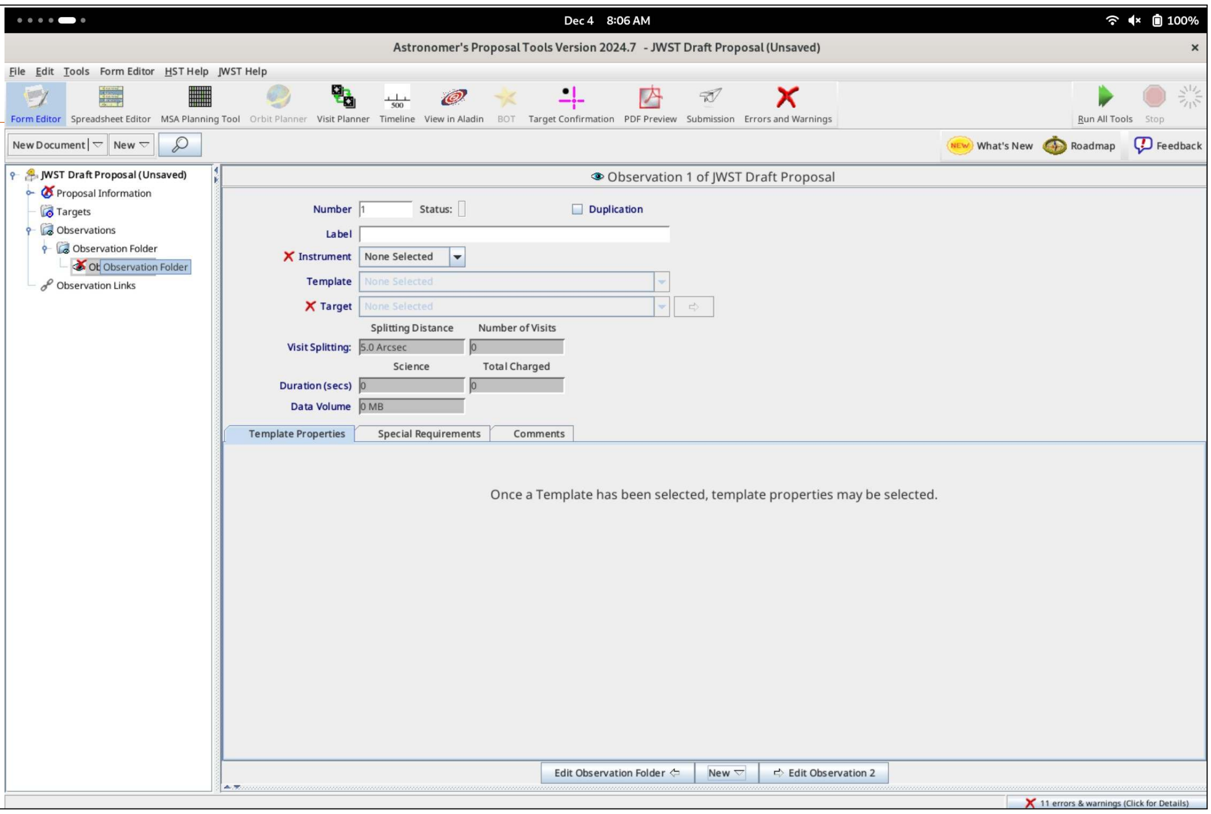
Astronomer's Proposal Tools Version 2024.7 - JWST Draft Proposal (Unsaved)
File Edit Tools Form Editor HST Help JWST Help
Form Editor Spreadsheet Editor MSA Planning Tool Orbit Planner Visit Planner Timeline View in Aladin BOT Target Confirmation PDF Preview Submission Errors and Warnings
Run All Tools Stop
New Document New Co-I
What's New Roadmap Feedback
JWST Draft Proposal (Unsaved)
Proposal Information
Targets
Observations
Observation Links
Proposal Information of JWST Draft Proposal
Title
Abstract
Remaining characters: 1700
Proposal ID
Category GO Calibration Treasury GO-Archival Multi-Observatory
Pure Parallel Proposal
Cycle 4 Reset to Draft...
▶ Explain unschedulable observations
▶ Supply Meteoroid Zone Justification
▶ Number of Target Of Opportunity Activations
Science Time (hours) 0.0
Charged Time (hours) 0.0
Data Volume (MB) 0.00
▶ Request custom time allocation
▶ Future cycles
Proposal Size Very Small (This proposal will be reviewed by an external panel)
Exclusive Access Period Default Default is 12 Months
Allow Restricted (this session only)
Scientific Category None Selected
Alternate Category None Selected (Optional)
Science Keywords +/-
Choose 2 to 5 science keywords.
Edit Previous New Edit Proposal Description
9 errors & warnings (Click for Details)



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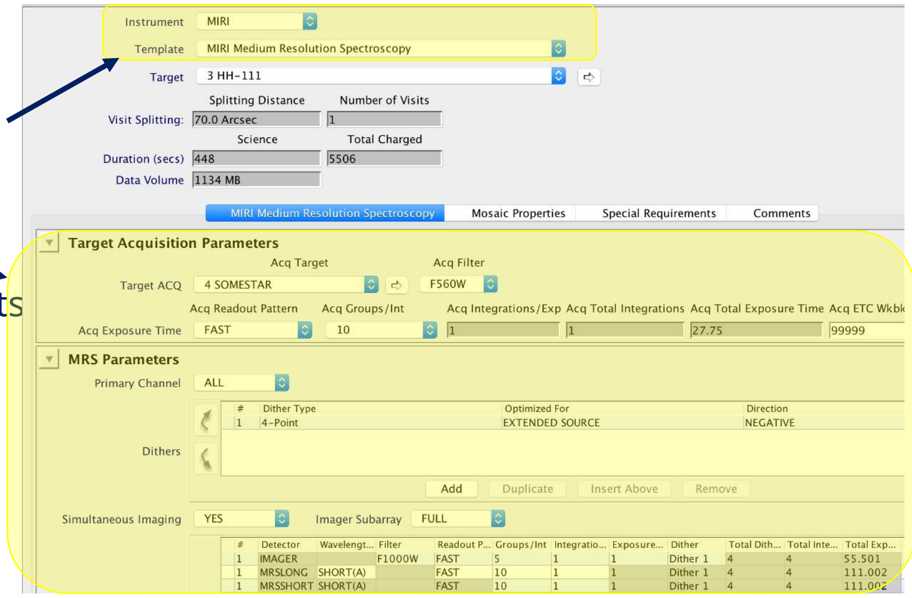
Form Editor Spreadsheet Editor MSA Planning Tool Orbit Planner Visit Planner Timeline View in Aladin BOT Target Confirmation PDF Preview Submission Errors and Warnings
Run All Tools Stop
New Document New
What's New Roadmap Feedback
JWST Draft Proposal (Unsaved)
Proposal Information
Targets
Observations
Observation Folder
Ot Observation Folder
Observation Links
Observation 1 of JWST Draft Proposal
Number 1 Status: Duplication
Label
Instrument None Selected
Template None Selected
Target None Selected
Splitting Distance Number of Visits
Visit Splitting: 5.0 Arcsec 0
Science Total Charged
Duration (secs) 0 0
Data Volume 0 MB
Template Properties Special Requirements Comments
Once a Template has been selected, template properties may be selected.
Edit Observation Folder New Edit Observation 2
11 errors & warnings (Click for Details)

What is an APT Observation?

- User specified
- Single observing mode (template)
- All parameters for exposures and scheduling requests

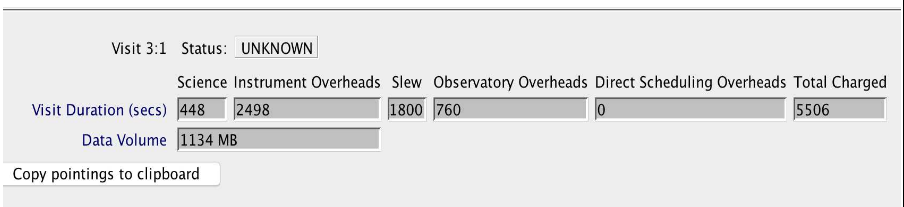


Additional Resource: [JDox Article: APT Observations]

What is an APT Visit?

- A Visit is set of exposures and associated overheads that can be executed, without interruption, using a single guide star.
  - This is what makes Visits the “scheduling unit” used by the scheduling system.

- A typical Visit includes
  - o Slew to guide star position
  - o Instrument overheads
    - ▪ Guide star acquisition
    - ▪ Target acquisition (if needed)
    - ▪ Small Angle Maneuvers (SAMs)
  - o Science exposures
- Add-on to the Visit duration
  - o Observatory overheads
    - ▪ Station keeping
    - ▪ Momentum management
  - o Direct scheduling overheads
    - ▪ Very tight timing constraints
    - ▪ Rapid turnaround of target of opportunities

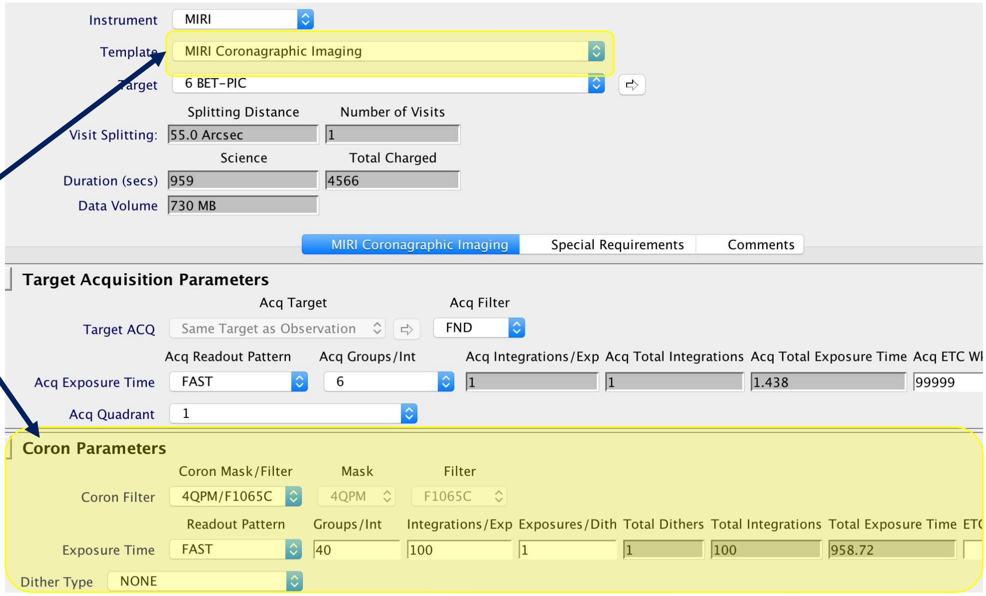


(Note: Gray boxes contain information reported by APT for user information only; cannot be edited directly.)

APT Observation Templates

Template Form changes based on selection of instrument and observing mode.

Ex: Coronagraphy requires a number of parameters not needed by other modes, so this only shows up when coronagraphy templates are selected.

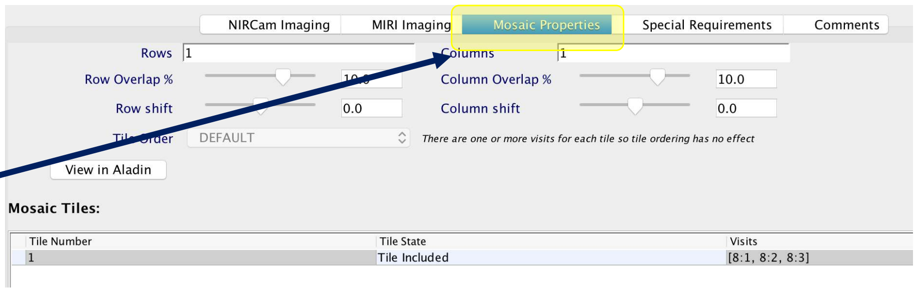


Additional Resource: [JDox Article: APT Observation Templates]

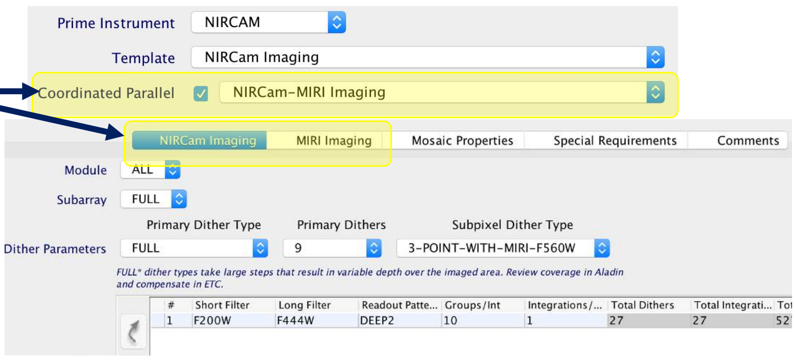
APT Observation Templates

Other operations that can change based on selected Templates:

- Whether mosaicking is allowed



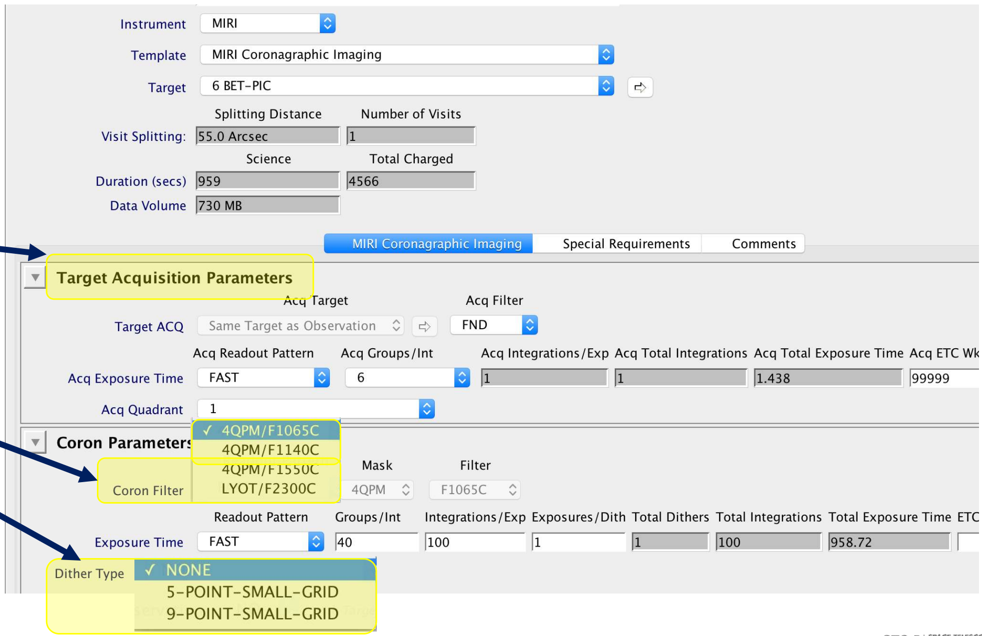
- Whether coordinated parallels are allowed (and choices available)



APT Observation Templates

Other operations that can change based on selected Templates:

- Whether Target Acquisition is needed (or not)
- Details of dithering and filter/grating selections available

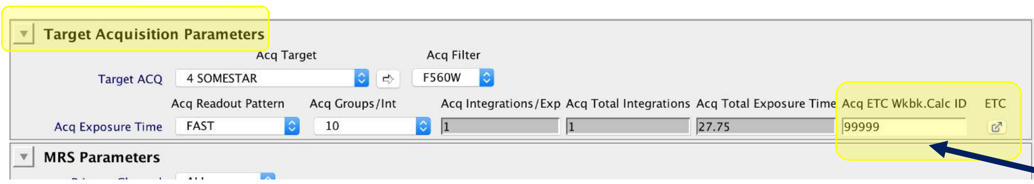


APT Target Acquisition

- Some templates have no target acquisition
- Some templates require a target acquisition
- Some templates, the target acquisition is optional

NOTE: If the target acquisition fails, the observation fails!

Users should obtain accurate target acquisition exposure information using the [JWST Exposure Time Calculator] and transfer to APT.



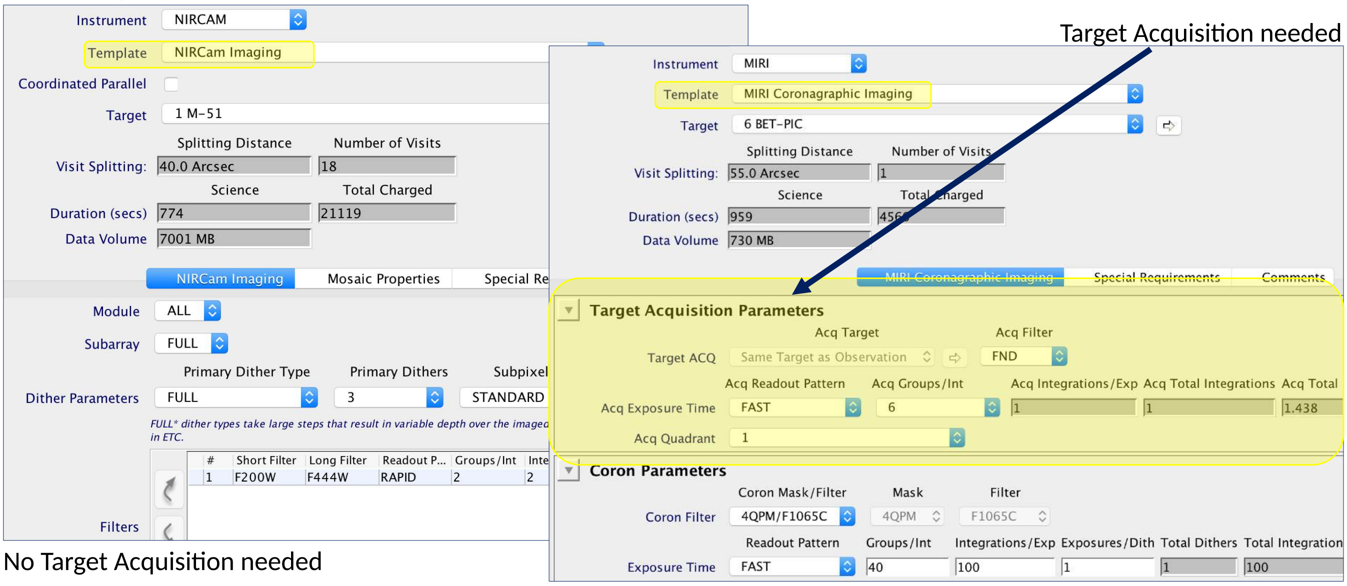
Note: optional annotation box, useful for documenting your calculation ID!

Additional Resources:

- JDox Article: APT Target Acquisition
- JDox Article: APT to ETC Connectivity

APT Observation Templates

Target Acquisition needed



No Target Acquisition needed

APT Special Requirements

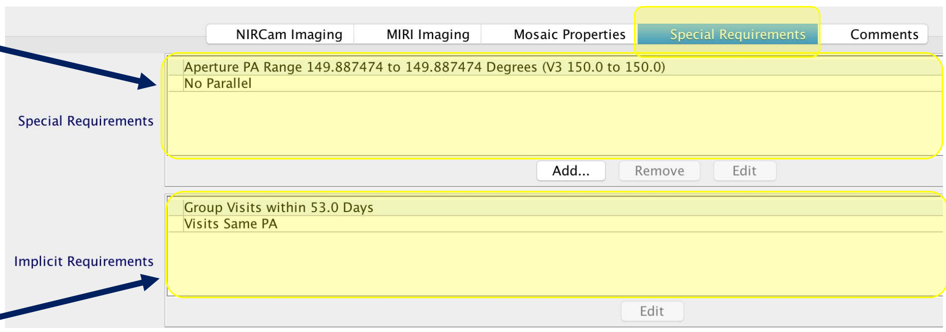
Additional constraints placed on specific observations.
Applied at the observation level.

- Affects all visits within an observation

Explicit requirements: set by user

- Must be justified by the science goals
- Can decrease scheduling availability

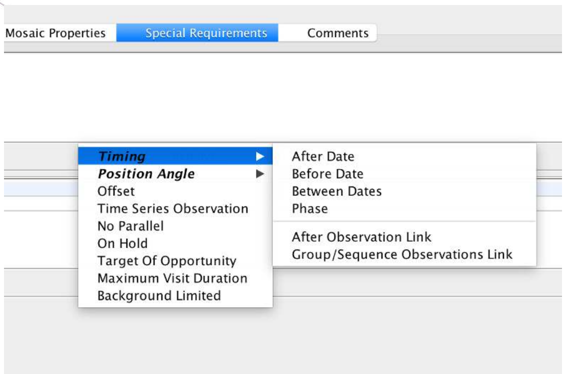
Implicit requirements: set by APT and reported for your information.

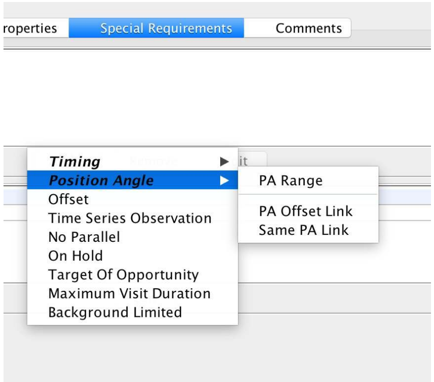


Additional Resources:

- JDox Article: APT Special Requirements
- YouTube Video Tutorial: APT Special Requirements

APT Special Requirements





Timing requirements: Several options

- Observation needs to execute at a particular time or time window.
- Observation needs to happen at some time relative to another observation.
- Several observations need to execute together without interruption.

Position angle requirements: Several options

- Observation needs to execute at a particular PA or within some range.
- Observation needs to happen at an offset angle from another observation.
- Observation needs to happen at same angle as another observation

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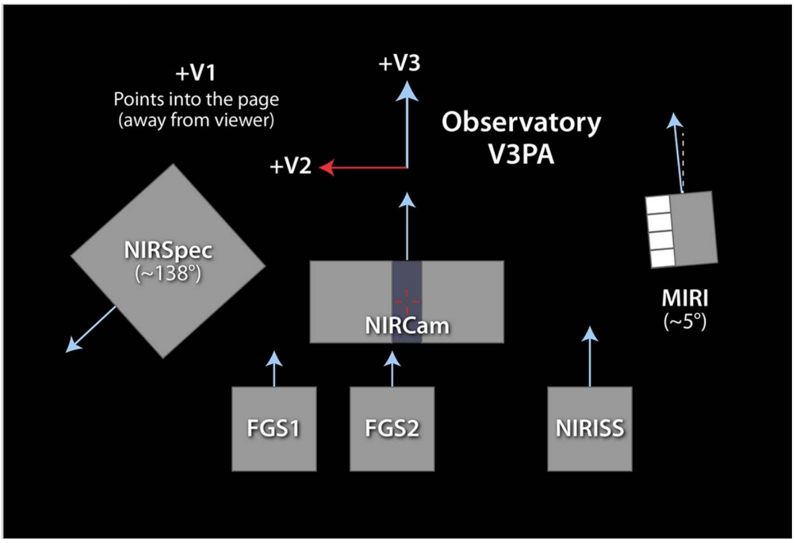
V3 Position Angle (V3PA) vs Aperture Position Angle (APA)



Instrument	Offset Angle from V3
NIRCam	0.0°
MIRI	4.45°
NIRISS	0.57°
NIRSpec	138.5°

V3PA is the observatory reference angle used by APT diagnostics and the scheduling system.

APA is specific to each instrument, and is the PA (degrees east of north as projected onto the sky) of the reference axes shown as light blue arrows at left.

Additional Resource: JDox Article: Position Angles, Ranges and Offsets

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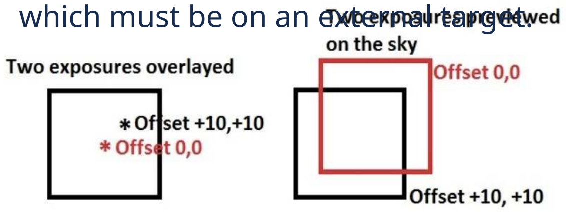
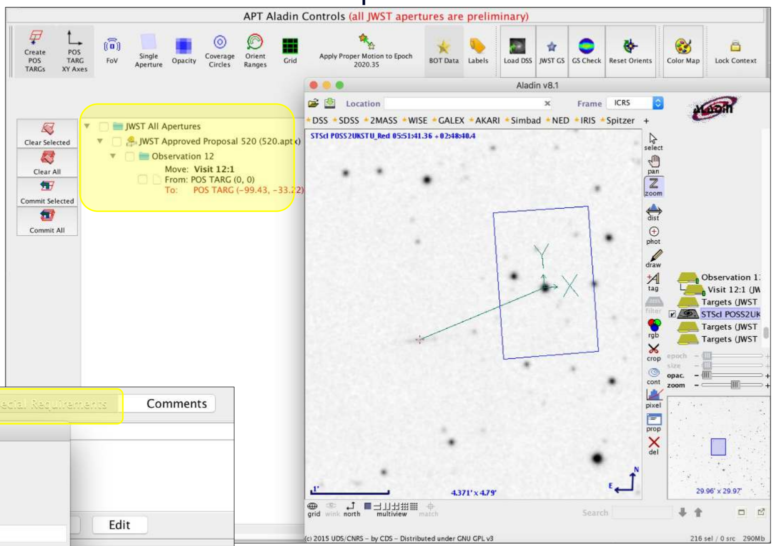
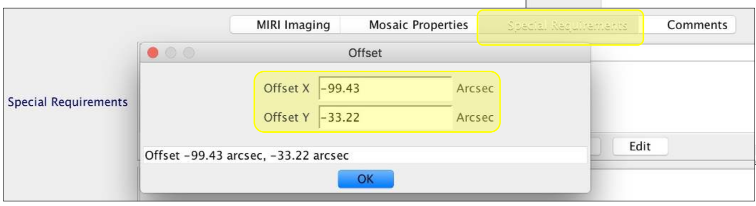
APT Special Requirement

Ex: Offset special

An Offset specifies a non-default placement of the target, relative to the aperture fiducial
point in the instrument field of view, which must be on an external target.







APT Visit Planner

The APT visit planner performs a detailed check of the *schedulability* of the visits in observations, including visibility, constraint checking, and whether guide stars are available.

Diagnostic information is provided when scheduling checks fail. But interpreting this information can be tricky.

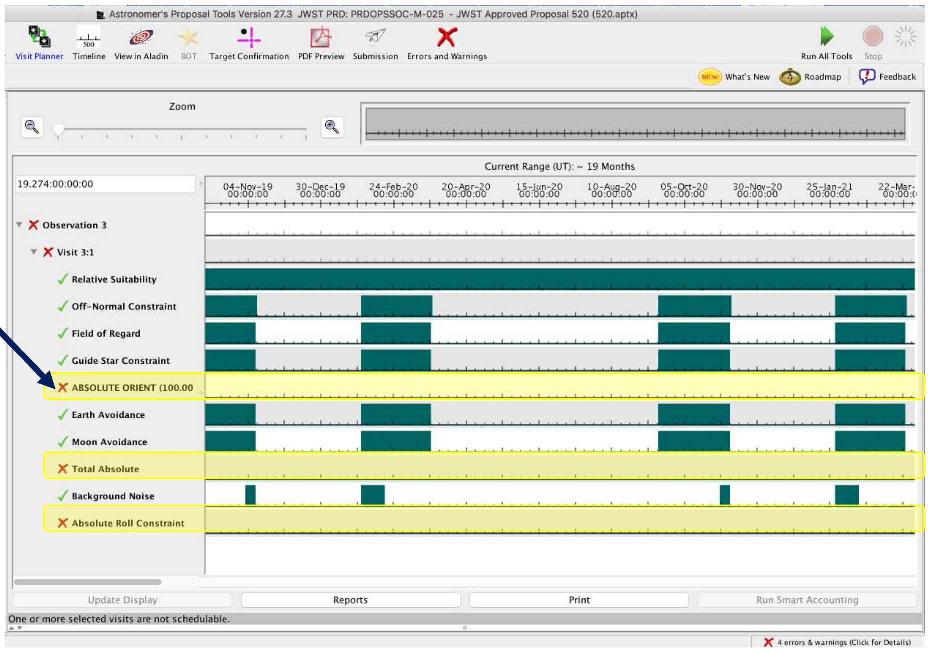
The following slides walk through a couple of example cases to give you a sense of how to use the available reports and graphs.

Additional Resources:

- JDox Article: APT Visit Planner
- YouTube Video Tutorial: APT Visit Planner

APT Visit Planner Diagnostics – Position Angle Problems

Observation fails scheduling check: Issue with ORIENT (aka position angle)



Note: all constraints windows need to have a window of schedulability at the same time.

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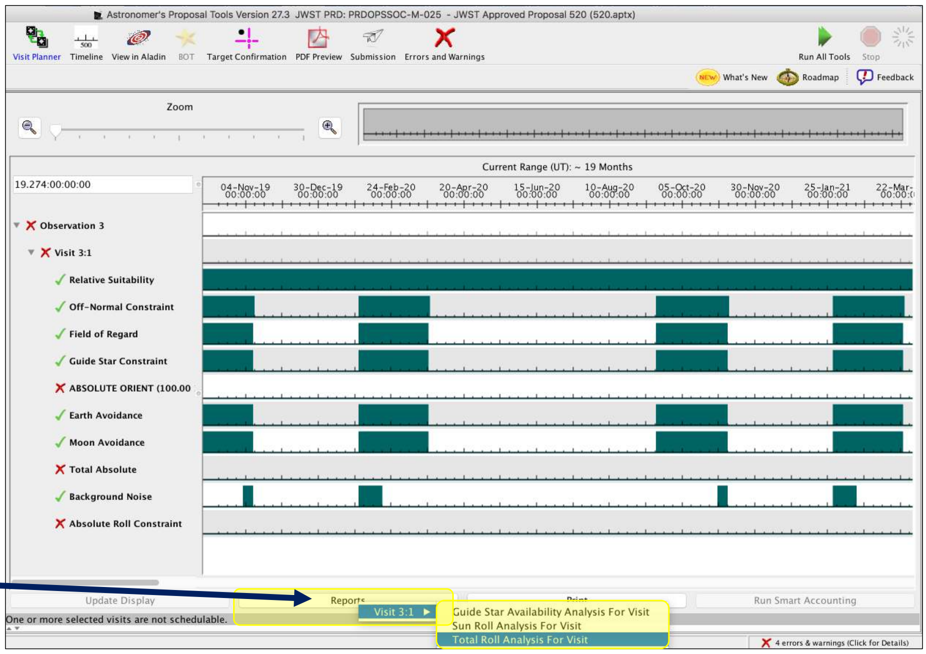
APT Visit Planner Diagnostics – Position Angle Problems



To review the Roll Angle Report/Graph

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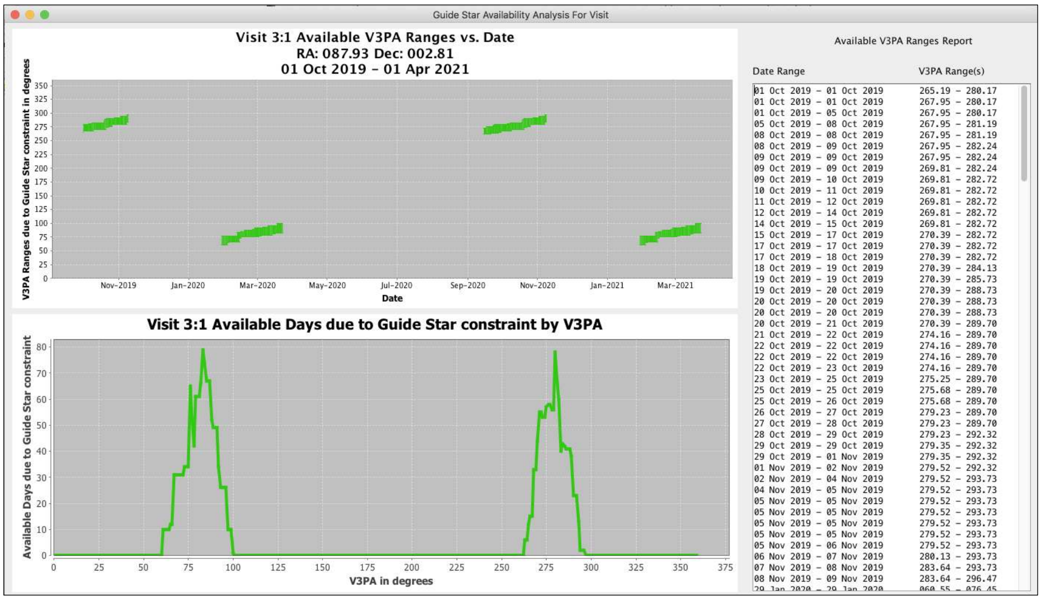
APT Visit Planner Diagnostics – Position Angle Problems

Graph shows range of
V3 position angles available as a function of date.

Graph shows the number of days each V3 position angle is available.



Report of Available Date/Angle Ranges

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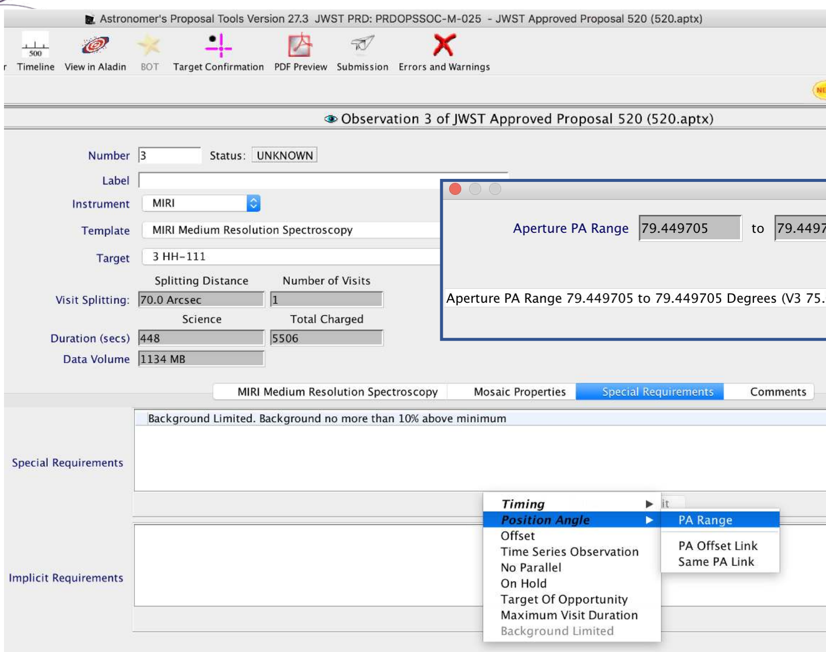
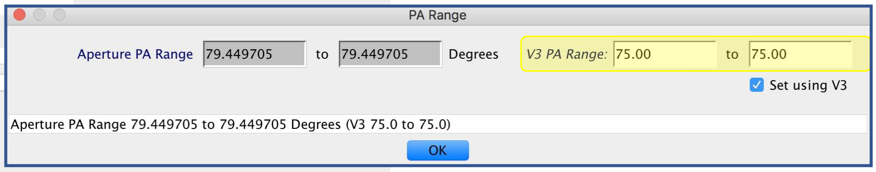
APT Visit Planner Diagnostics – Position Angle Problems





Go to the Special Requirements in template, edit the V3PA

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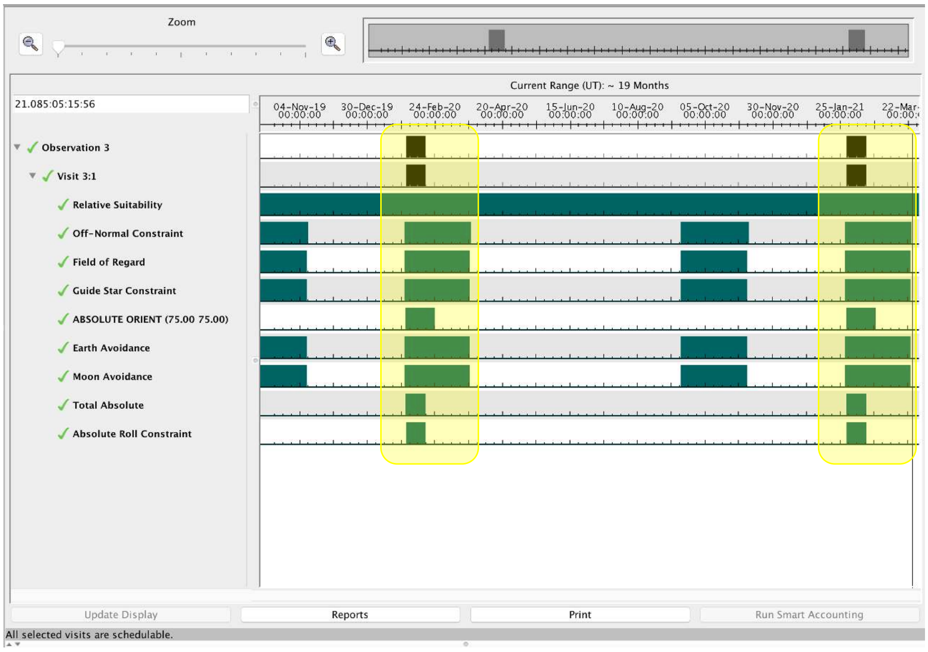
APT Visit Planner Diagnostics – Position Angle Problems

Observation now passes scheduling check:
All constraints have green check marks and the constraint windows overlap.



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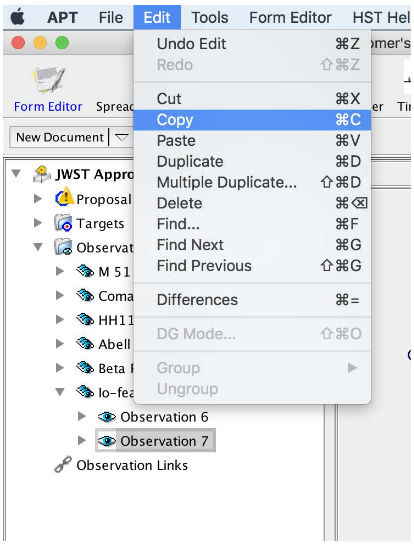
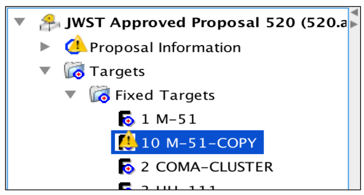
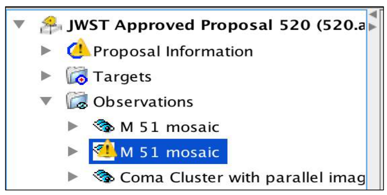
Other Useful APT Capabilities – Copy/Paste

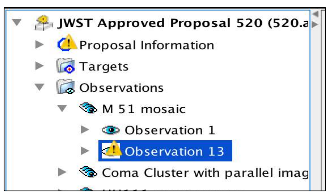
Copy/Paste a target, observation folder, or observation within your proposal or into a separate proposal.

Important to revise a label to provide clear tracking within your proposal.









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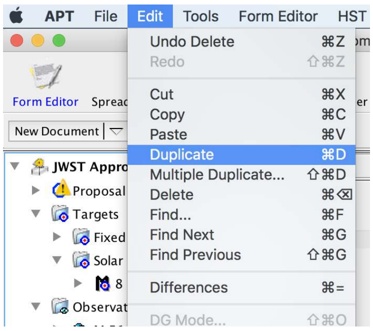
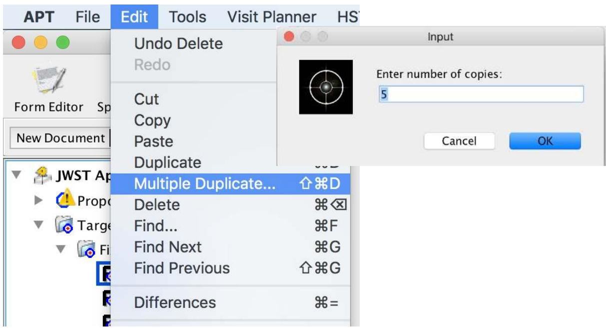
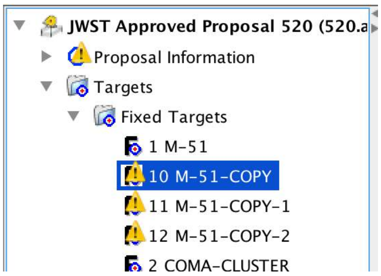
Other Useful APT Capabilities – Duplicate

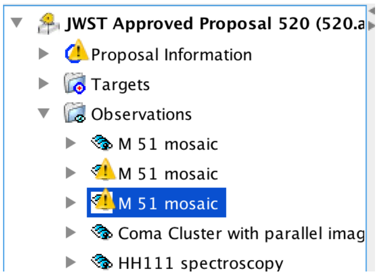
Duplicate/Multiple Duplicate a target, observation folder or observation

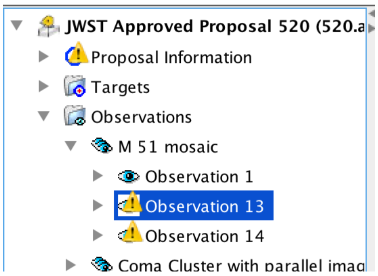
Important to revise a label to provide clear tracking within your proposal.











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APT Overheads

- **JWST autonomous operations are complex.**
  - There are many activities that need to occur to set up each observation. While most are fairly short, in the ensemble, the time can add up.
  - Slewing and settling take time, even for small motions.
- **By policy, JWST amortizes the estimated time for calibrations and observatory and charges to each program.**
  - Pre-launch estimate for this is 16%, which is included by APT.
- **But to first order, overheads are what they are.**
  - There is not too much you can do to lower your overhead charges by changing details in APT.
  - The Smart Accounting step in APT makes a reasonable attempt to lower artificially high overheads. (Covered below.)

Our best advice to you is to concentrate on the science you want to do and don't be overly concerned about overheads!

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APT Overheads, continued

- **Direct overheads – activities directly associated with an observing program**
  - major slews
  - mechanism motion times
  - guide star acquisition times
  - small angle maneuvers
  - target acquisitions
- **Indirect overheads – activities performed for the general support of science observations (16%)**
  - calibrations
  - momentum management
  - wavefront sensing and control
  - other observatory maintenance activities

- **Instrument overheads – activities directly associated with each instrument**
  - Filter/grating changes
  - detector readout
  - Instrument operations script compilation time

Additional Resource:
- JDox Article: JWST Overheads and Time Accounting Overview

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APT Overheads, continued

- **Many overheads are known from ground testing, and can be applied deterministically (those occurring within a visit)**
  - **mechanism motions (filter or grating wheel rotations, other setup activities).**
  - **Small Angle Maneuvers (SAMs) (e.g., motions between dither steps or mosaic tiles).**
  - **target acquisition time (when needed).**
- **Statistical time estimates – assumed average time of activities that depend on the exact sequence of events when scheduled.**
  - **Ex: Initial slew time from previous observation to the first visit of your observation cannot be known by APT.**
  - **Scheduling studies indicate an average initial slew time of 2100 s.**
  - **This is charged once per observation, but see below (Smart Accounting)**
- **Some overheads are combinations!**
  - **Guide star acquisition time assumed includes a statistical estimate of how often initial failures and retries will need to be executed.**
  - **But then this fixed time is charged to each visit.**

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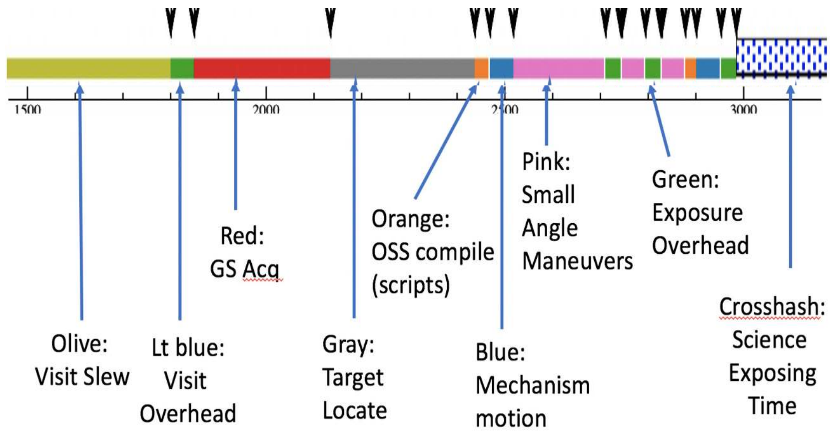
APT Graphical Timeline

- **Shows a summary of various overheads affecting the proposed observations.**
- **Provides you with insight into the major steps that occur and the times accounted to each.**
- **Is not meant to represent the actual detailed set of events that occur in the onboard execution of the observation.**



Additional Resources:

- JDox Article: APT Graphical Timeline
- YouTube Video Tutorial: APT Graphical Timeline

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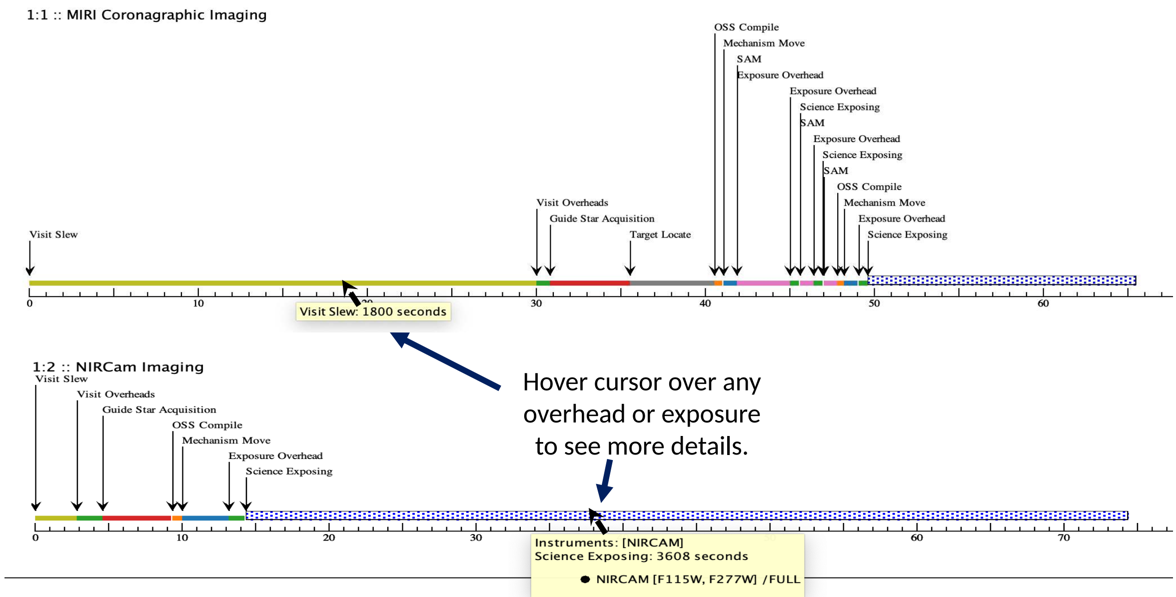
APT Graphical Timeline Examples

Initial visit, relatively short science exposure; overheads dominate

A second visit, relatively fewer overheads, long science exposure



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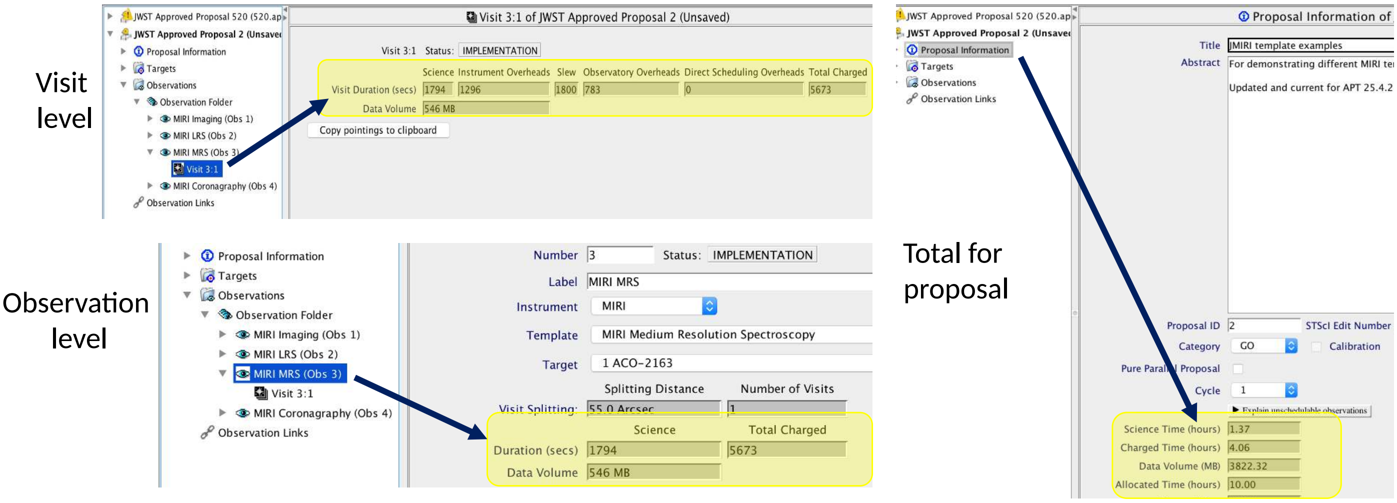
APT Science Time and Total Charged Time

Science time and total charged time (including overheads) can be viewed in APT at the proposal level, the observation level, and visit level.



Considerations for Minimizing Overheads

- Most large overheads are charged to visits and observations.
- Look for opportunities to reduce the number of visits, which reduces guide star acquisitions charges.
  - APT makes visits, so be aware of the Visit Splitting Distance.
  - Ex: Adjusting tile spacing on mosaics (as seen earlier).
  - Ex: Consider impact of dither selection.
- Don't specify "unnecessary" observations.
  - Seems obvious, but it is easy to do if you are not paying attention!
  - Ex: Observing same target with multiple filters; If you naively put each filter exposure in a separate observation, it gets expensive quickly.
    - Each observation incurs 1800 s initial slew charge.

APT Overhead Charge Corrections (Smart Accounting)

- While designing and building an observing program, overheads can become overestimated as observations are added individually.
  - Ex: NIRCam and MIRI imaging requested on the same source, will likely be scheduled back-to-back.
  - Ex: Many targets closely spaced on the sky, will likely be scheduled in close succession.
  - In both cases, initial assumptions of a large 1800 s slew to start each observation are likely a significant overestimate.
- Running ***Smart Accounting*** on your finished observations searches for and removes extra initial slews and other smaller inefficiencies that may have crept in.
  - Some programs will see a significant correction while others will not.

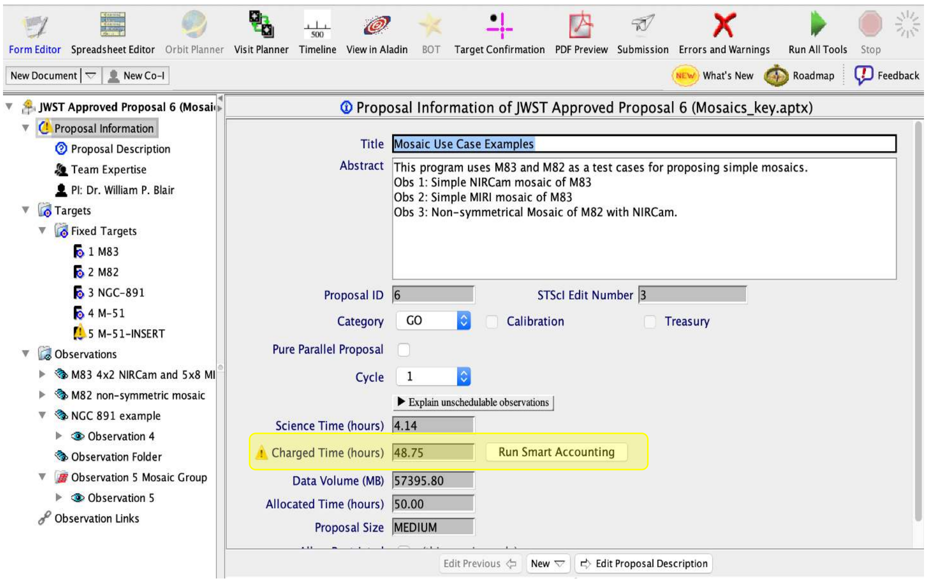
Note: While Smart Accounting may reduce your proposal's total time request (which is good for you!), this adjustment is important in a larger sense, to provide the best estimate of overall observatory resource usage expected. So…

Always run Smart Accounting before submitting your proposal!

Where to find and run Smart Accounting in APT

Because of the importance of running *Smart Accounting*, APT provides several places where it can be invoked.

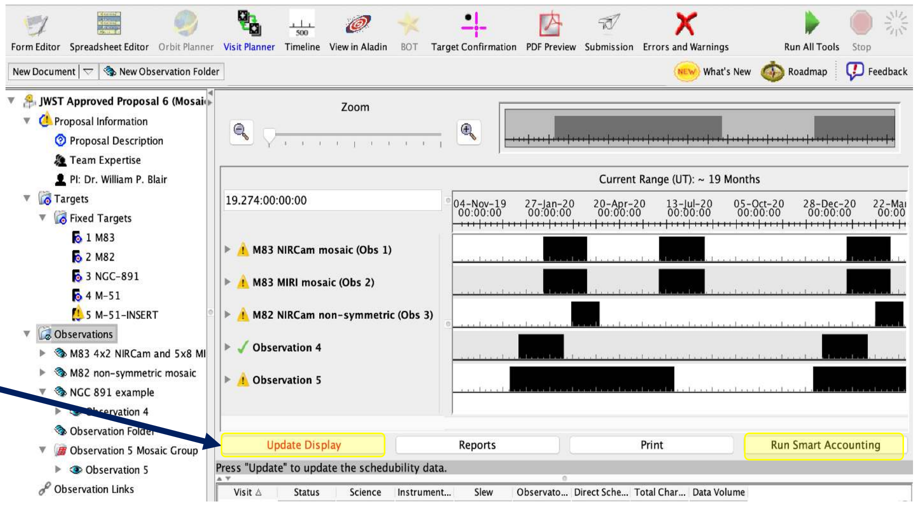
- **From a button right on the Proposal Information page.**



Where to find and run Smart Accounting in APT

Because of the importance of running *Smart Accounting*, APT provides several places where it can be invoked.

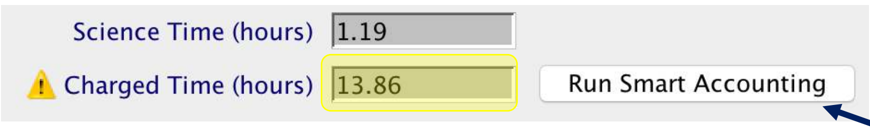
- **From a button right on the Proposal Information page.**
- **From within the Visit Planner**
  - **By clicking the "Run Smart Accounting" button at lower right.**
  - **Or simply by selecting your entire observation folder in the tree editor and running the "Update Display" button in the Visit Planner.**



APT Smart Accounting Hint

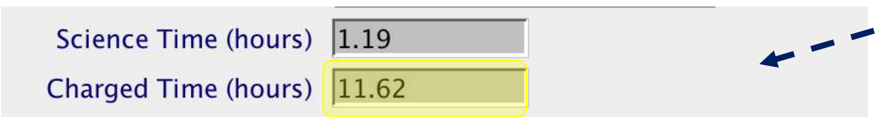
To see the impact of Smart Accounting, note the total charged time on the Proposal Information page prior to executing the task. Then compare to the result when the task completes.

Before Smart Accounting Run



Note: This button only appears when APT thinks the accounting is out of date.

After Smart Accounting Run



Additional Resource: [JDox Article: APT Smart Accounting]()

APT Science Time and Total Charged Time -- Summary

Science time vs. Total Charged Time is just informational for the proposer.

- Proposals with short exposures will be dominated by overheads.
- Proposals with relatively long exposures will have more balance.
- That's just the way it is for JWST observations. BUT
- The Time Allocation Committee (TAC) only sees the total resource request.

So don't obsess over the "efficiency" of your proposal.
Just concentrate on proposing the best science you can!

Slides - Hands-on Session: JWST data processing

STScI | SPACE TELESCOPE SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

JWST Data Processing

Karl D. Gordon
JWST-ALMA Workshop
Chalmers University of Technology
5 Dec 2024

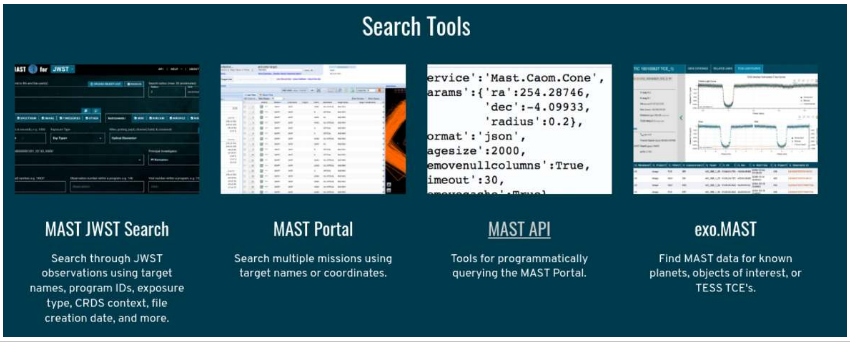
JWST Data processing

- How to get data
- jwst pipeline
- JWST data reduction algorithms
- JWebbinar learning materials
- Demo data reduction notebooks

- JDox for authoritative info
- Slides for multiple sources
  - Good stuff is a credit to others
  - Mistakes are all mine

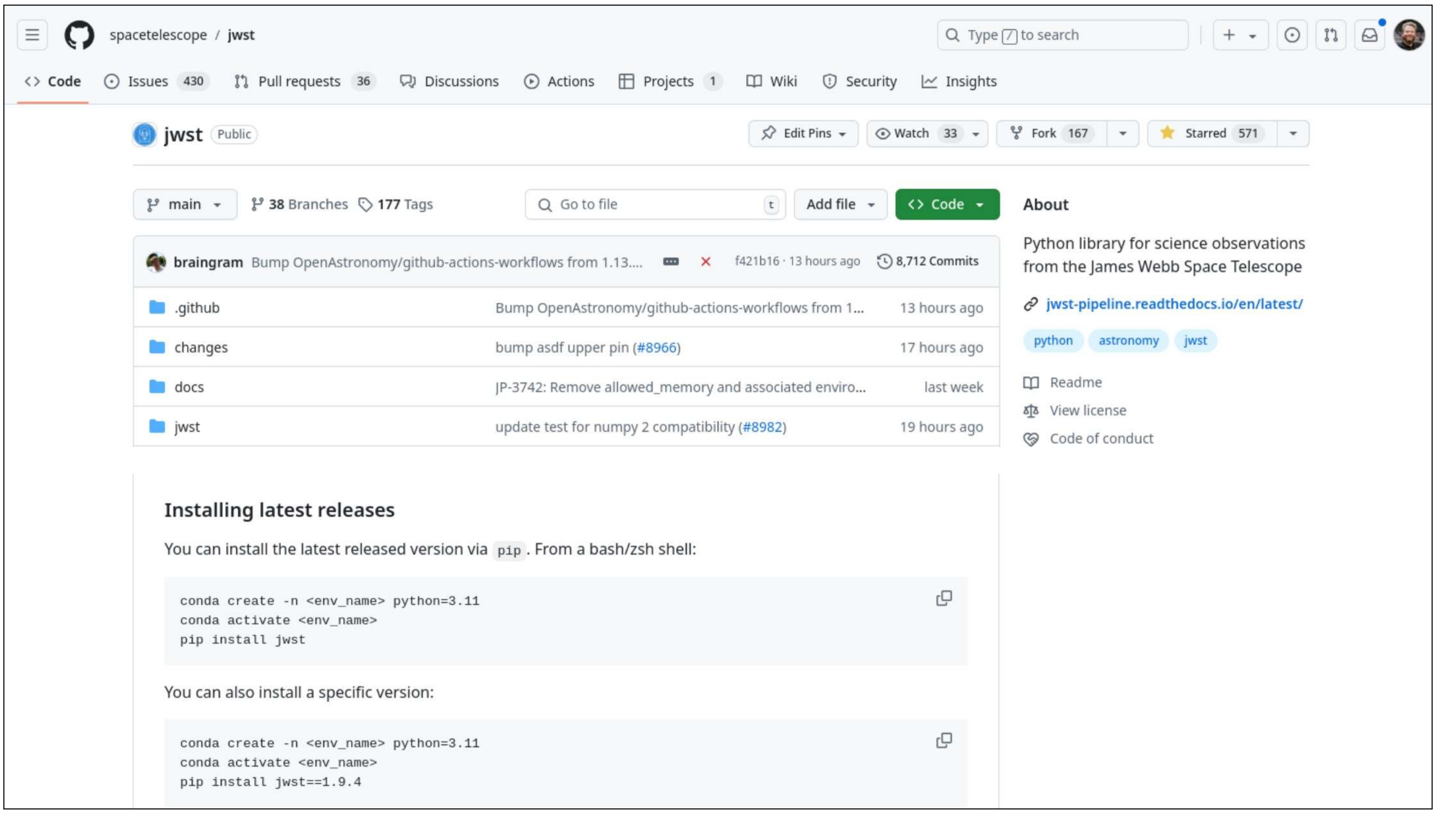
Get Data

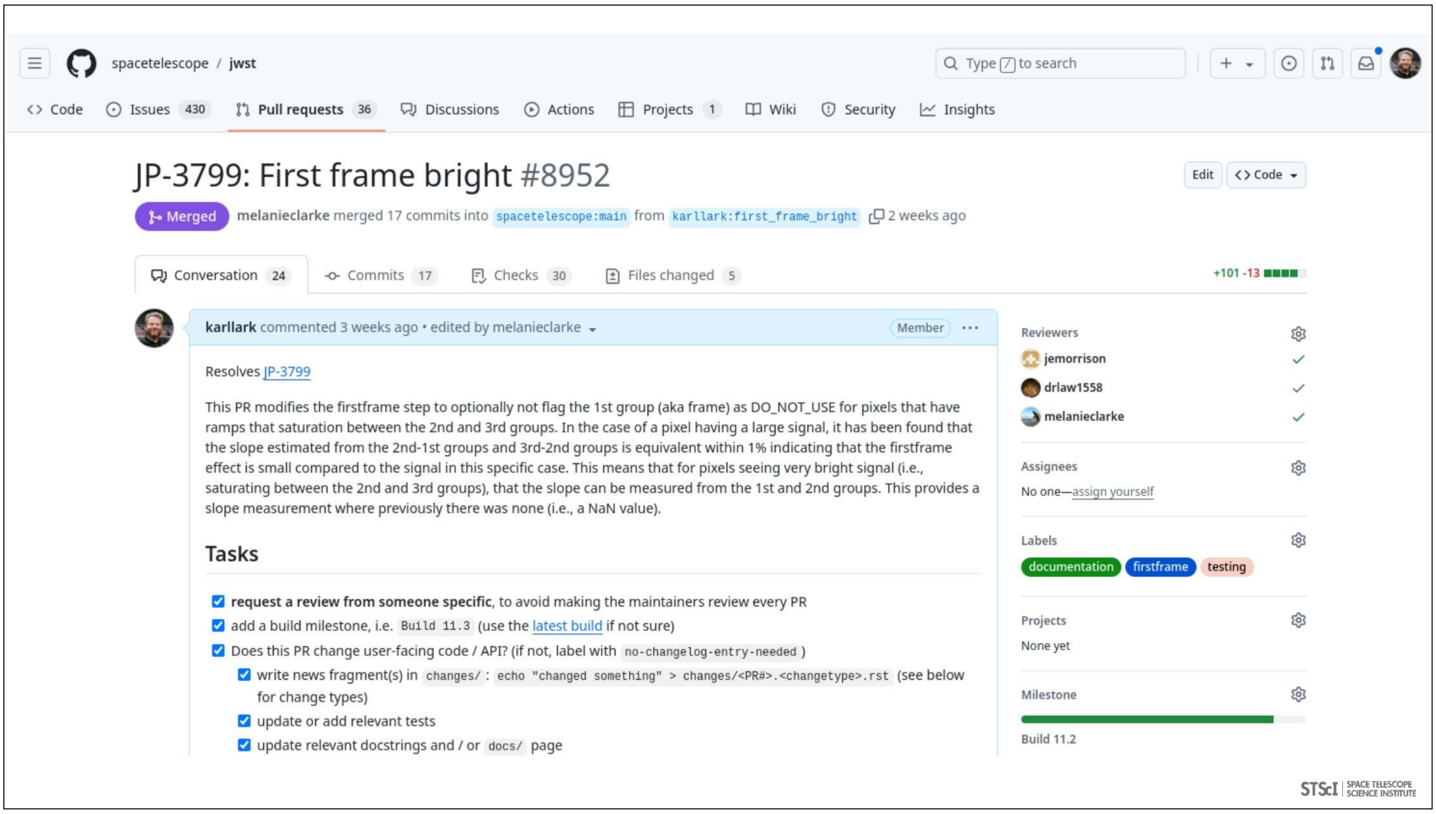
- From MAST archive
- Public data – search and download
- Exclusive Access data
  - MyST account and approved by PI of program
  - Exclusive access period = 12 months since data taken



Re-reduce data

- Tweak the data reduction
  - Use different parameters for some steps
  - Turn off some steps
  - Insert a custom step in the pipeline
- Use jwst pipeline
  - Python code
  - Full open-source, open-development project
  - Issues, pull requests, etc welcome from all


spacetelescope / jwst
Type / to search
Code
Issues 430
Pull requests 36
Discussions
Actions
Projects 1
Wiki
Security
Insights
jwst Public
Edit Pins
Watch 33
Fork 167
Starred 571
main
38 Branches
177 Tags
Go to file
Add file
Code
braingram Bump OpenAstronomy/github-actions-workflows from 1.13....
f421b16 · 13 hours ago
8,712 Commits
.github
Bump OpenAstronomy/github-actions-workflows from 1...
13 hours ago
changes
bump asdf upper pin (#8966)
17 hours ago
docs
JP-3742: Remove allowed_memory and associated enviro...
last week
jwst
update test for numpy 2 compatibility (#8982)
19 hours ago
About
Python library for science observations from the James Webb Space Telescope
jwst-pipeline.readthedocs.io/en/latest/
python
astronomy
jwst
Readme
View license
Code of conduct
Installing latest releases
You can install the latest released version via pip. From a bash/zsh shell:
conda create -n <env_name> python=3.11
conda activate <env_name>
pip install jwst
You can also install a specific version:
conda create -n <env_name> python=3.11
conda activate <env_name>
pip install jwst==1.9.4


spacetelescope / jwst
Type / to search
Code
Issues 430
Pull requests 36
Discussions
Actions
Projects 1
Wiki
Security
Insights
JP-3799: First frame bright #8952
Edit
Code
Merged
melanieclarke merged 17 commits into spacetelescope:main from karllark:first_frame_bright
2 weeks ago
Conversation 24
Commits 17
Checks 30
Files changed 5
+101 -13
karllark commented 3 weeks ago • edited by melanieclarke
Member
Resolves JP-3799
This PR modifies the firstframe step to optionally not flag the 1st group (aka frame) as DO_NOT_USE for pixels that have ramps that saturation between the 2nd and 3rd groups. In the case of a pixel having a large signal, it has been found that the slope estimated from the 2nd-1st groups and 3rd-2nd groups is equivalent within 1% indicating that the firstframe effect is small compared to the signal in this specific case. This means that for pixels seeing very bright signal (i.e., saturating between the 2nd and 3rd groups), that the slope can be measured from the 1st and 2nd groups. This provides a slope measurement where previously there was none (i.e., a NaN value).
Tasks
request a review from someone specific, to avoid making the maintainers review every PR
add a build milestone, i.e. Build 11.3 (use the latest build if not sure)
Does this PR change user-facing code / API? (if not, label with no-changelog-entry-needed)
write news fragment(s) in changes/: echo "changed something" > changes/<PR#>.<changetype>.rst (see below for change types)
update or add relevant tests
update relevant docstrings and / or docs/ page
Reviewers
jemorrison
drlaw1558
melanieclarke
Assignees
No one—assign yourself
Labels
documentation
firstframe
testing
Projects
None yet
Milestone
Build 11.2
STScI SPACE TELESCOPE SCIENCE INSTITUTE

JWST algorithms

- How were and are the algorithms picked?
  - An ongoing process
  - Your input welcome

- Pipeline written in modules
  - “straightfoward” to insert custom modules in the data reduction flow

Team Effort

JWST Calibration Working Group

Current Lead:
Greg Sloan

Past Leads:
Christine Chen
Karl Gordon
Anton Koekemoer

Current JWST Calibration Working Group Members

Instrument / Branch (Team)	Primary STScI representatives in CalWG meetings	Other STScI (on email list, not specifically required to join every meeting)	IDT / external representatives (on email list, welcome to join in meetings), to add any new members please contact @Anton Koekemoer
NIRCam (STScI) NIRCam (IDT)	@Armin Rest @Bryan Hilbert	@Alicia Canipe * @Brian Brooks * @John Stansberry * @Julien Girard @Martha Boyer @Massimo Robberto @Matteo Correnti * @Nikolay Nikolov	@Marcia Rieke @Douglas Kelly @Everett Schlawin @Jarron Leisenring @Jonathan Fraine @Karl Misselt
NIRISS (STScI) NIRISS (IDT)	@Kevin Volk @Swara Ravindranath	@Anand Sivaramakrishnan @André Martel @Deepashri Thatte @Joseph Filippazzo @Nestor Espinoza * @Paul Goudfrooij * @Stephanie La Massa	@Loic Albert Jason Rowe
NIRSpec (STScI) NIRSpec (ESA)	@Cheryl Pavlovsky @James Muzerolle	@Elena Sabbi @Emily Wislowski @Graham Kanarek @Leonardo Ubeda @Tony Keyes	@Pierre Ferruit @Catarina Alves de Oliveira @Giovanna Giardino @Nora Luetzgendorf @Stephan Birkmann @Tim Rawle @Torsten Boeker
MIRI (STScI) MIRI (IDT)	@Misty Cracraft * @Karl Gordon *	@Beth Sargent @Bryan Holler * @David Law @Dean Hines * @Greg Sloan * @Macarena Garcia Marin @Mattia Libralato @Sarah Kendrew *	@George Rieke @Jane Morrison @Kate Su @Michael Ressler @Patrice Bouchet @Alistair Glasse @Alvaro Labiano @Bart Vandenbussche @Christophe Cossou @Jeroen Bouwman @Martin Topinka @Pamela Klaassen @Patrick Kavanagh @Silvia Scheithauer @Vincent Geers
FGS / Telescopes	@Sherie Holfeltz @Ed Nelan	@Pierre Chayer @Randal Telfer	
MESA	@Michael Regan @Rosa Diaz	@Douglas Long @Eddie Bergeron @Van Dixon	
Science Instrument Calibration Software Branch support:			
SCSB	@Nadia Dencheva @Howard Bushouse	@Jonathan Eisenhamer @James Davies @Larry Bradley @David Grumm @Warren Hack	

Learning from Past Efforts

- Previous Missions
  - Hubble, Spitzer, Herschel, etc.
  - Ground-based observatories/instruments
    - Especially important for integral field spectroscopy (IFU), coronagraphy, and multi-object spectroscopy (MOS)
- What to do
- What not to do

Pipeline Philosophy

- Algorithms based on community best
  - Input from instrument teams and mode specific expert teams
  - Overall goal is best justified algorithms
- Use same code for different instruments
  - Where possible
  - Easier to maintain
  - Takes advantage of strengths of all teams
- Provide pipeline directly to community

Development Plan

- Baseline Pipeline
  - All instruments and all modes
  - Provides good science
  - Meets requirements
  - Algorithms defined – implementation in progress
  - Pipeline at Launch
- Enhanced Pipeline
  - Best possible reductions
  - Highest quality science data
  - This is the final goal (launch + many years)
  - Start work after baseline pipeline done and continue for the mission lifetime and beyond
    - Will need to prioritize effort

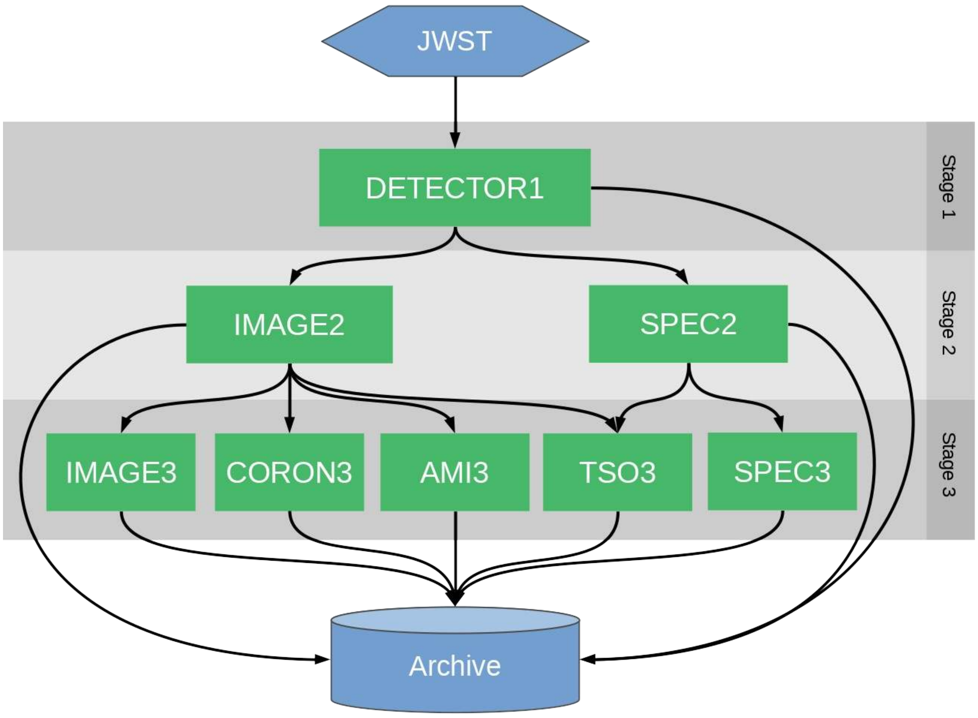
User Experience

- Pipeline automatically run on all data
- Default parameters for all pipeline steps
- Pipeline products produced and archived
  - Final as well as raw and intermediate products
- User can download and run pipeline locally
  - Change defaults
  - Add customized reduction steps
  - Pipeline may require internet connection for telemetry and reference file queries

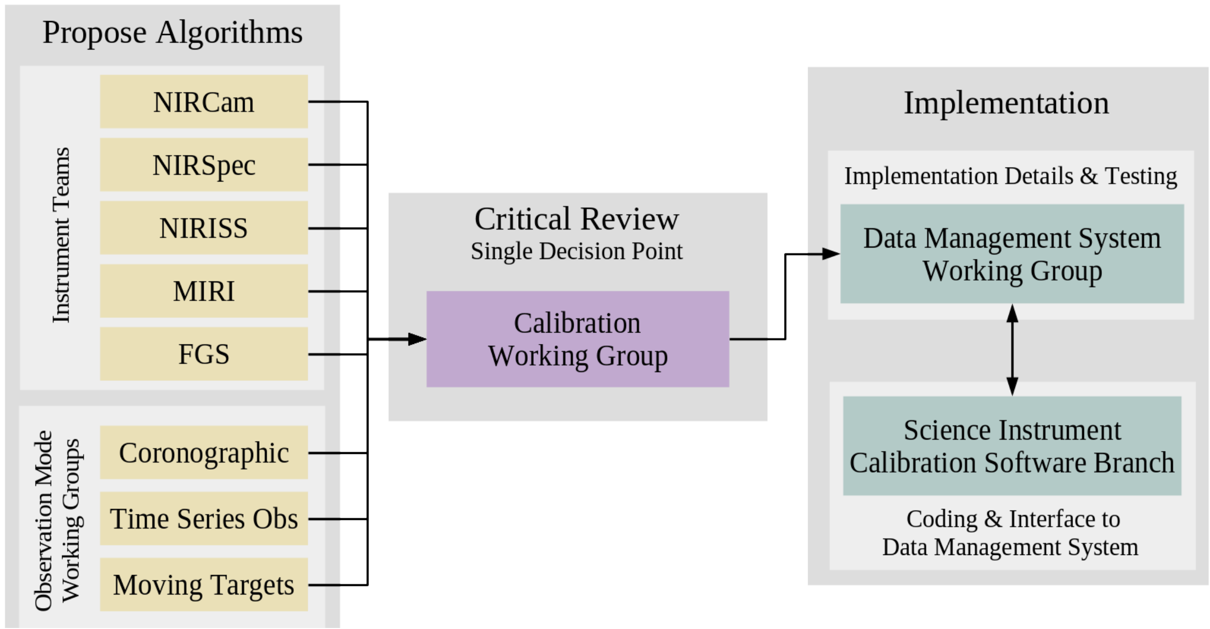
Pipeline versus Data Analysis Tools

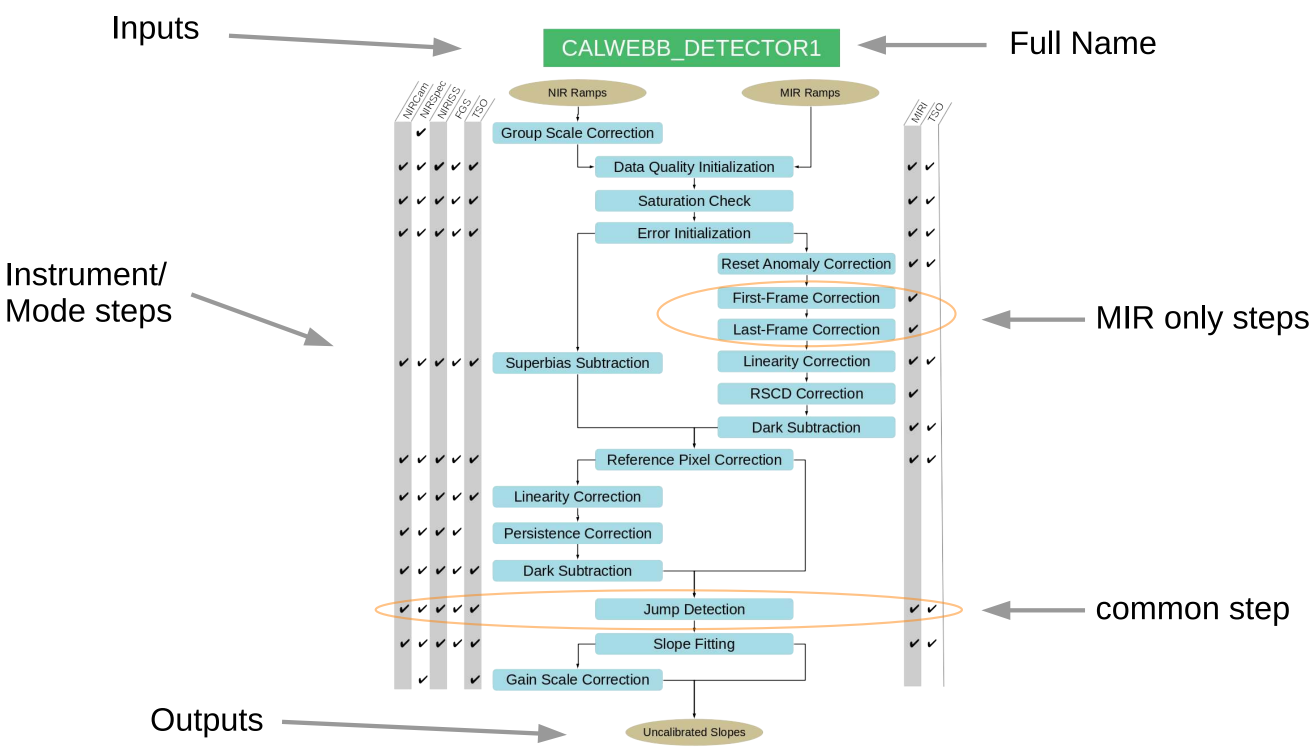
- Pipeline
  - Automatically runs on all data
  - Requires no human interaction
- Data Analysis Tools
  - Requires science decisions – human interaction
  - Usually based on pipeline products
- Overlaps
  - For example, parts of the pipeline can be re-run interactively with non-default options

Overview

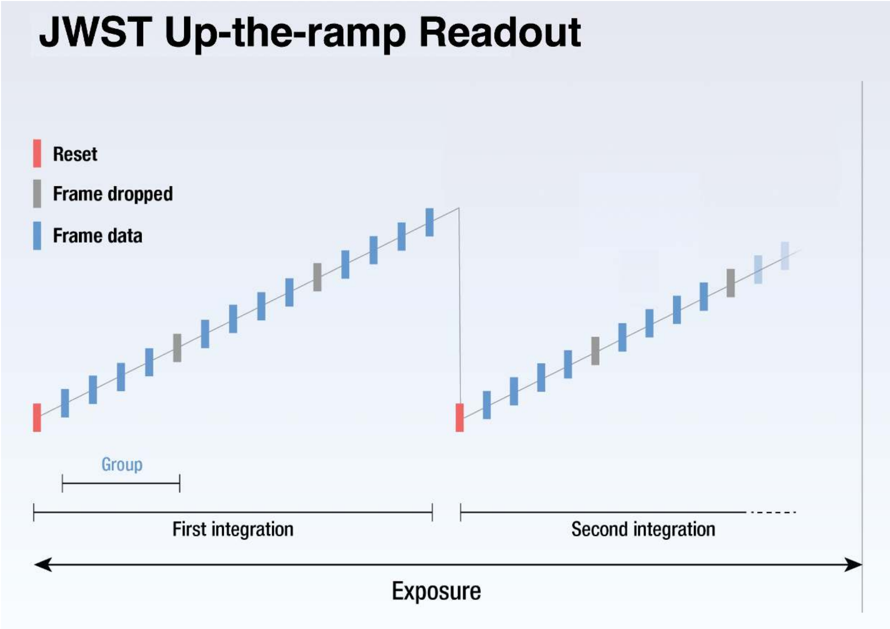


Algorithms Decisions

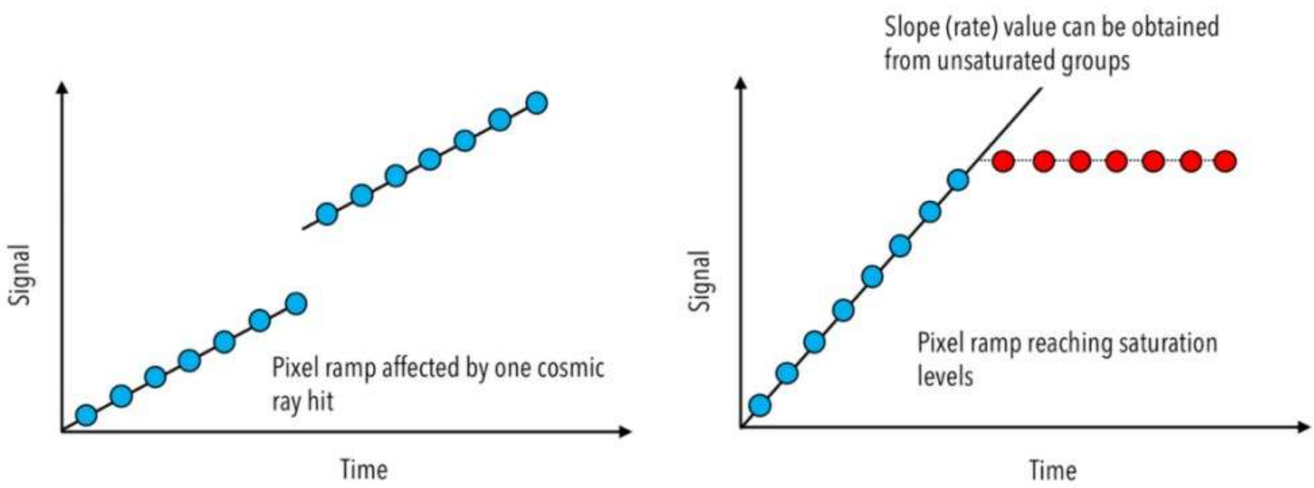




JWST Measurement = Ramp → Slope



Ramp Jumps and Saturation



CALWEBB_IMAGE2

Uncalibrated Slopes

Step	NIRCam	NIRSpec	NIRISS	MIRI	FGS	TSO	TA
WCS Information	✔	✔	✔	✔	✔	✔	✔
Background Subtraction	✔		✔	✔			
Flat Field Correction	✔	✔	✔	✔	✔	✔	✔
Flux Calibration	✔		✔	✔	✔	✔	
Rectified 2D Product	✔	✔	✔	✔	✔	✔	✔

Calibrated Slopes

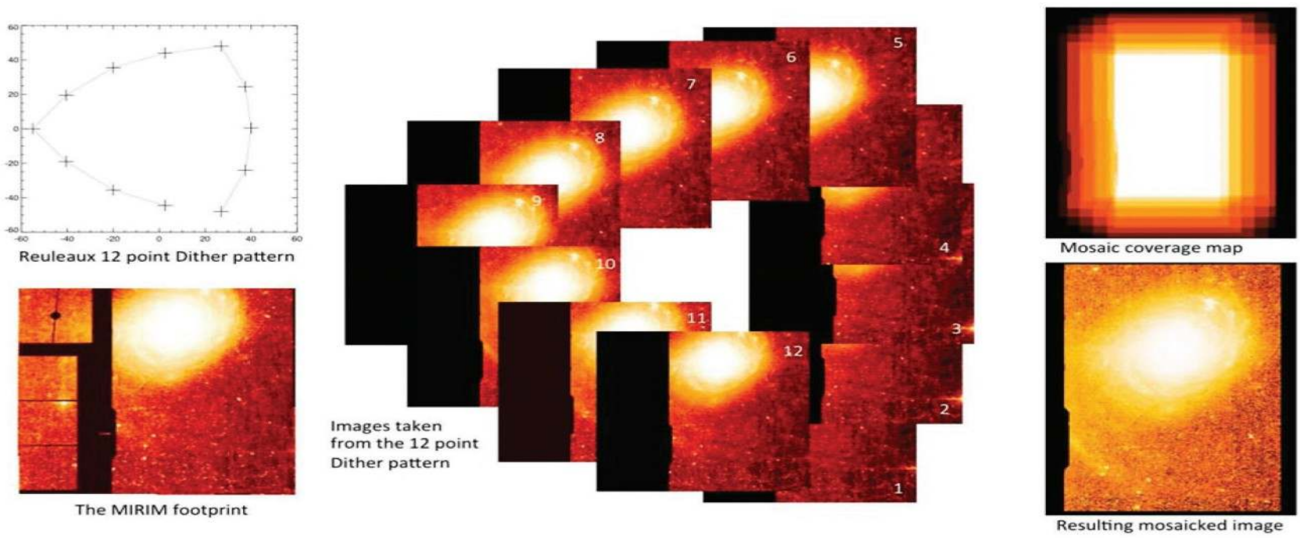
CALWEBB_IMAGE3

Calibrated Slopes

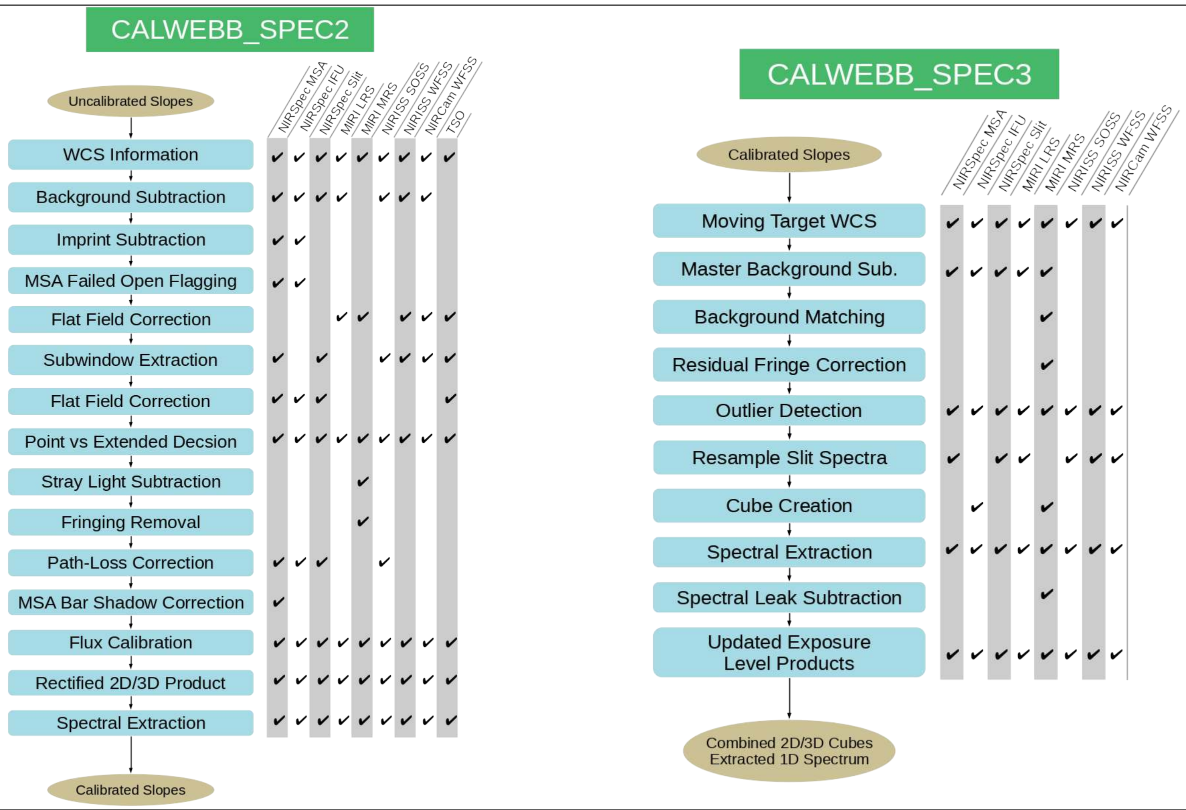
Step	NIRCam	NIRISS	MIRI	FGS
Refine WCS	✔	✔	✔	✔
Moving Target WCS	✔	✔	✔	✔
Background Matching	✔	✔	✔	✔
Outlier Detection	✔	✔	✔	✔
Imaging Combination	✔	✔	✔	✔
Source Catalog	✔	✔	✔	✔
Updated Exposure Level Products	✔	✔	✔	✔

Mosaics
Source Catalog

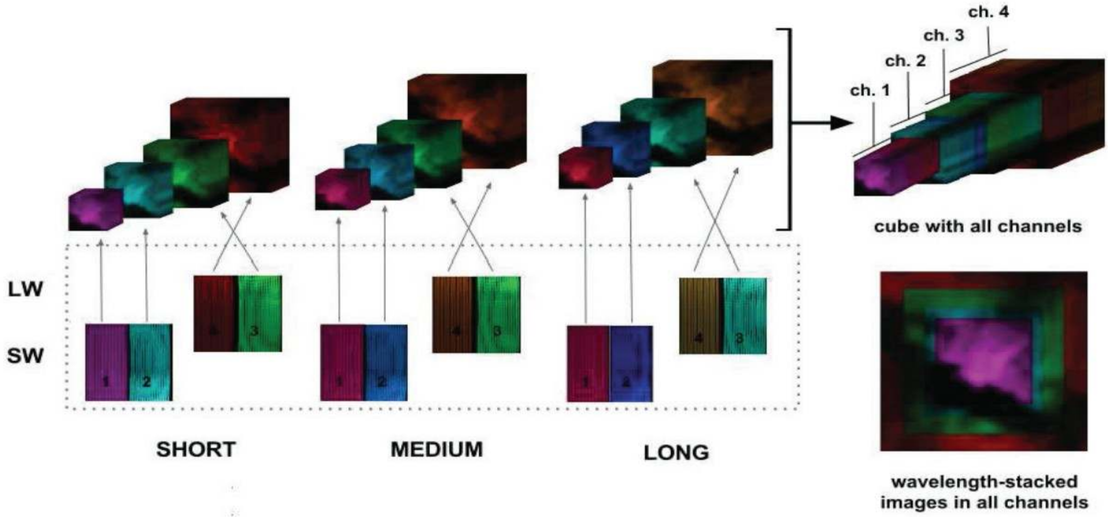
Imaging Data Products: Example



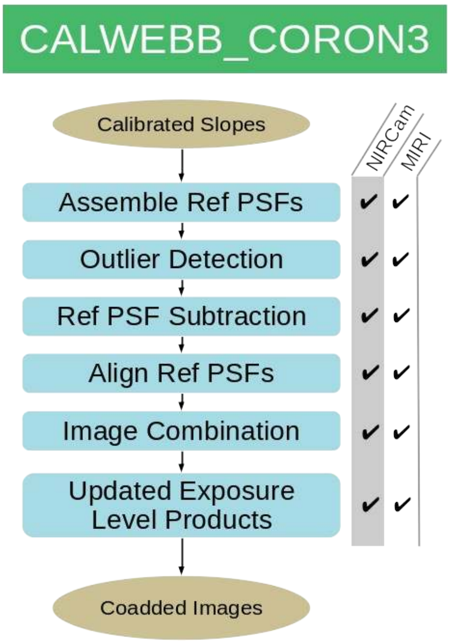
Gordon et al. (2015, PASP, 127, 696) – MIRI PASP paper X

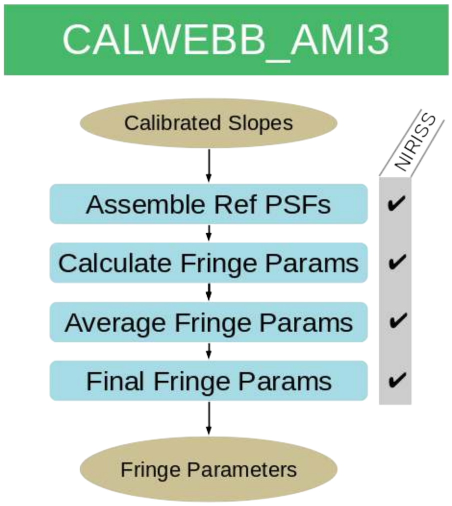


Spectroscopic Data Products: IFU Example

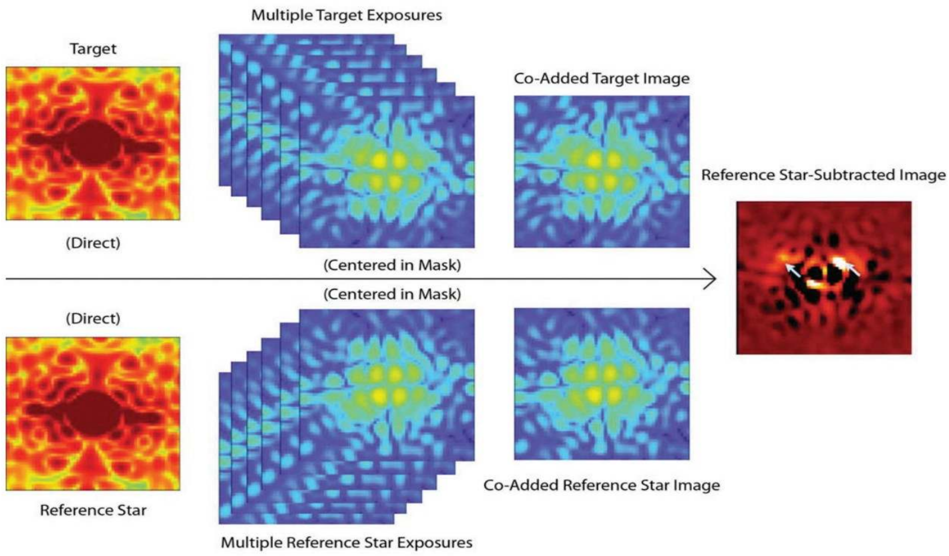


Gordon et al. (2015, PASP, 127, 696) – MIRI PASP paper X

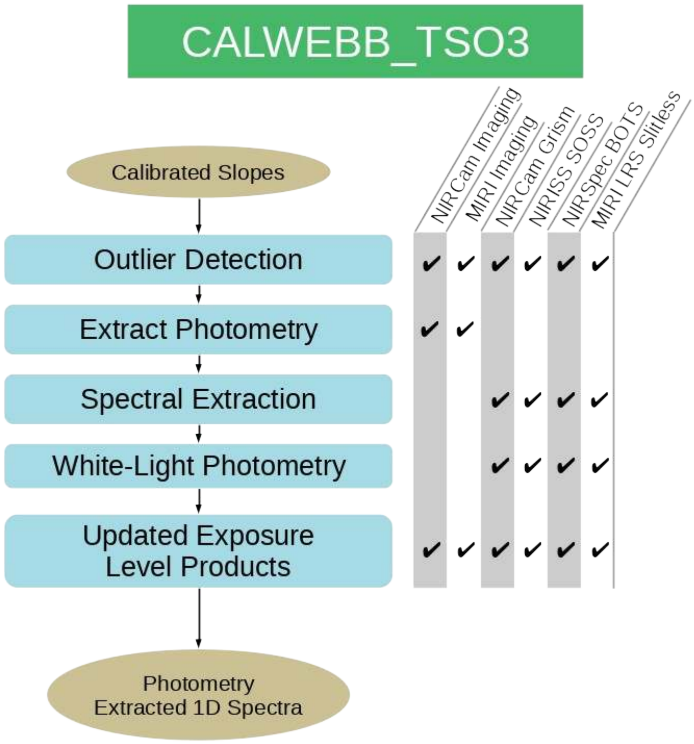




Coronagraphic Data Products: MIRI 4QPM Example



Gordon et al. (2015, PASP, 127, 696) – MIRI PASP paper X



More Pipeline Information

- Algorithm details
  - https://jwst-docs.stsci.edu/jwst-data-reduction-pipeline/algorithm-documentation
- Code focused documentation
  - https://jwst-pipeline.readthedocs.io/en/latest/index.html

Learning Materials

Learning JWST Data Analysis With the JWebbinars

STScI hosts *JWebbinars* to teach the JWST community about tools and methods to analyze data from the James Webb Space Telescope. Each JWebbinar provides virtual, hands-on instruction on common data analysis methods for JWST observations.

Typical JWebbinar topics include:

- Overview of data analysis tools and data products
- The JWST pipeline for imaging
- The JWST pipeline for spectroscopy
- Analyzing IFUs and spectral cubes
- Analyzing MIRI photometry
- Analyzing time series spectroscopy
- Accessing data in MAST

Jwebbinar Details

- Information & Registration: 2024 Sessions [+]
- Materials & Videos [+]
- 2023 Sessions [+]
- 2022 Sessions [+]
- 2021 Sessions [+]
- Frequently Asked Questions [+]

31 - Pipeline Reprocessing of JWST Imaging Data	Link to presentation: • Introduction Links to notebooks in PDF: • MIRI • MIRI sky background • NIRCam Github for the notebooks: • MIRI • MIRI sky background • NIRCam	1. Pipeline Reprocessing Overview 2. Pipeline Processing of MIRI Imaging Data 3. Create and Subtract a Sky Background 4. Custom Reprocessing of NIRCam Data
30 - MOS Planning with MPT using an Example Science Case	Link to presentation: • MPT APT file NIRCam image	1. Planning Observations with NIRSpec Micro-Shutter Assembly (MSA) 2. MSA Planning Tool (MPT) and Initiating a Multi-Object Spectroscopy (MOS) Plan 3. Wavelength Planning 4. Final Tips for a Successful Observation

JWST documenation: JDox

WEBB SPACE TELESCOPE

JWST User Documentation

Home About PDFs Helpdesk

FÖRBÄTTRAT AV Goo

Proposing Opportunities

- Opportunities and Policies
- Call for Proposals for Cycle 4
- Cycle 3 Director's Discretionary (DD) Time Proposals
- Director's Discretionary Time
- General Science Policies
- JWST Peer Review Information
- Past Proposal Opportunities

Observatory

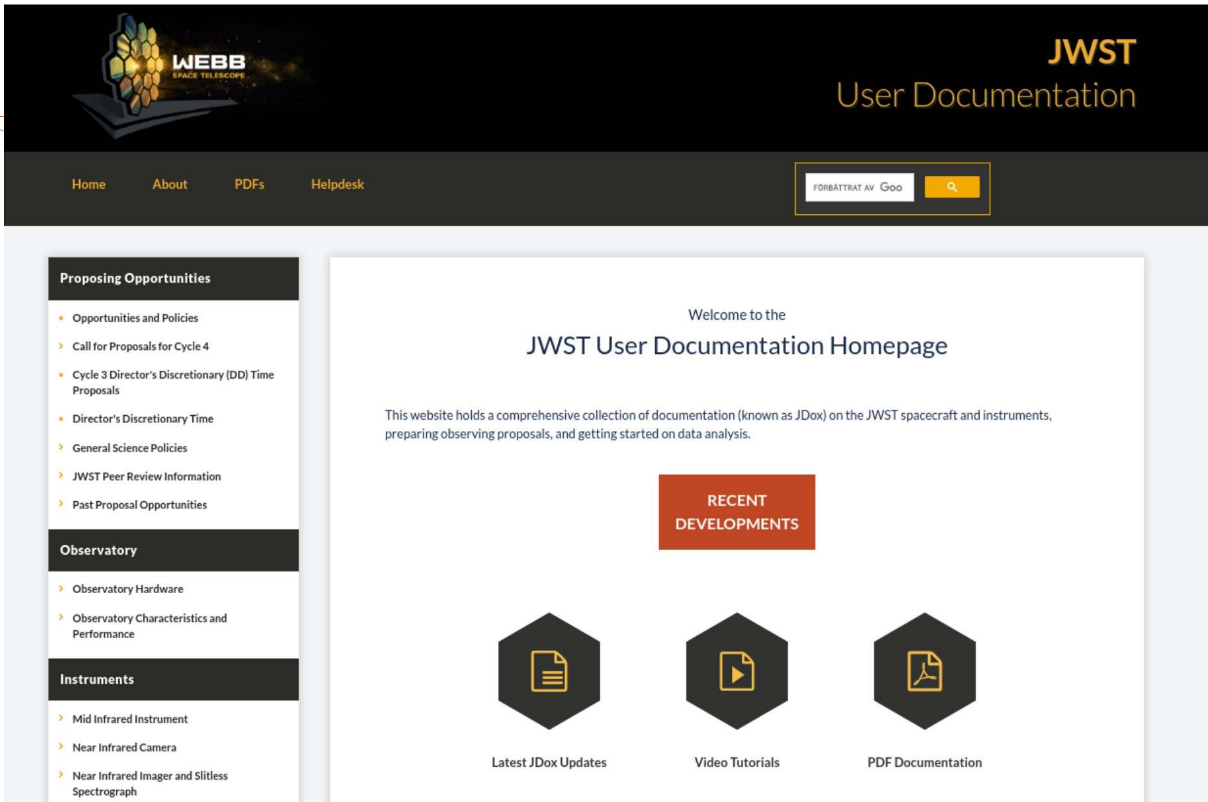
Home / JWST Science Calibration Pipeline / JWST Pipeline Notebooks

JWST Pipeline Notebooks

Jupyter notebooks, a JSON-based interactive Python interface, is a powerful and convenient way to run the JWST pipeline that can be easily configured and shared. This article provides links to a selection of such notebooks that help demonstrate how to reduce JWST data using the JWST Science Calibration Pipeline.

On this page

- Curated pipeline notebooks
- Pipeline caveat notebooks
- JDAT and Jdaviz notebooks
- Outdated notebooks
  - Outdated data product notebooks
  - Outdated pipeline notebooks



Demo data reduction notebooks

- Data reduction jupyter notebooks
  - Currently covers
    - NIRCam, NIRISS, MIRI imaging
    - MIRI MRS IFU spectroscopy
- https://github.com/spacetelescope/jwst-pipeline-notebooks
- All require the jwst pipeline to be installed
  -
- All have a demo mode that will download example data from the MAST

Slides - Introduction to interferometry

S. Muller
Nordic ARC node
Chalmers University of Technology, Sweden

CHALMERS

ALMA

EUROPEAN ARC
ALMA Regional Centre || Nordic

Outline

- Basic principles of interferometry
  - Visibilities, uv-plane
  - Problem of short spacings
- The effects of the atmosphere
  - Transmission in the mm/submm window
  - Phase stability
- [Calibration]
  - Flux accuracy
  - Bandpass calibration
  - Gains (amplitude and phase)
  - Astrometry

Outline

- Basic principles of interferometry
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- [Calibration]
  - Flux accuracy
  - Bandpass calibration
  - Gains (amplitude and phase)
  - Astrometry

The quest for angular resolution

= Being able to see details in astronomical objects

Standard **diffraction limit** in optics, with a circular aperture D:

Angular resolution: $\theta \sim \lambda/D$

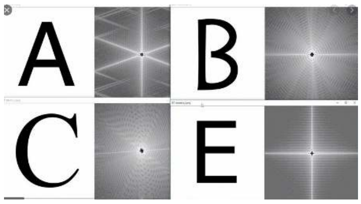
i.e., observing wavelengths / size of the instrument aperture

- Visible @550nm, D=100mm, θ ~ 1''
- Radio-mm @1mm(300GHz), θ ~ 1'', ... D ~ 200m

Mission of ALMA: get the same (or better!) resolution at mm-wave than Hubble Space Telescope in optical

Solution: Interferometry!

An interferometer samples
the Fourier transform
of the source intensity distribution

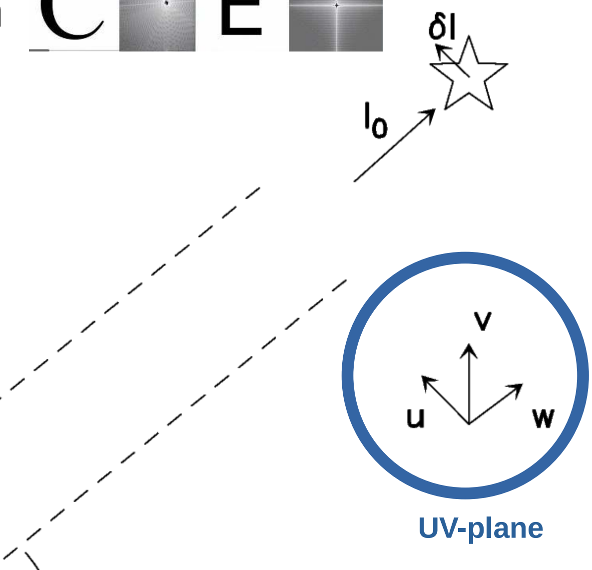


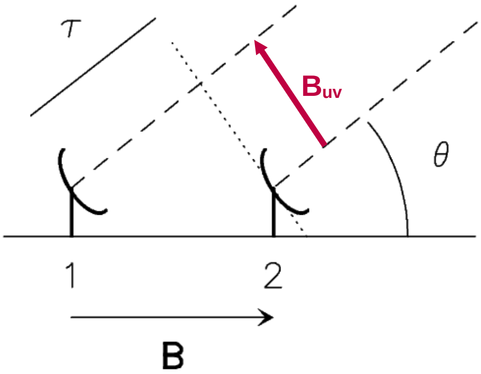
It measures visibilities:

$$V(u,v) = \iint I(x,y)\exp^{-i2\pi(ux+vy)}dxdy$$

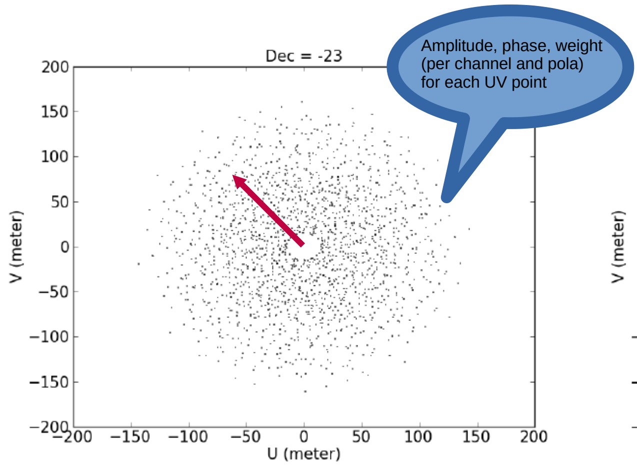
sampled by pair of antennas

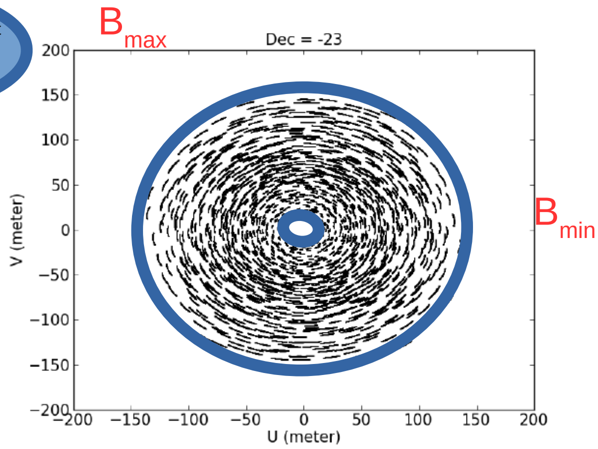
They are complex quantities
(amplitude and phase)





uv-plane coverage = sampling of spatial frequencies





Integration: 1 min 1 h

Incomplete sampling ... loss of information ... altering image reconstruction

Longest baselines ... Resolution ~ λ/B_{max}

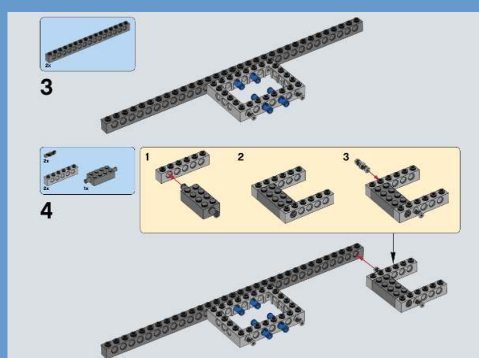
Central hole in uv-plane ... Maximum recoverable scale ~ λ/B_{min}

The Fourier transform decomposes an image into spatial frequencies (= break out into small and big Lego pieces)

FT

Amplitude

Phase



The Fourier transform decomposes an image into spatial frequencies (= break out into small and big Lego pieces)

FT

Amplitude

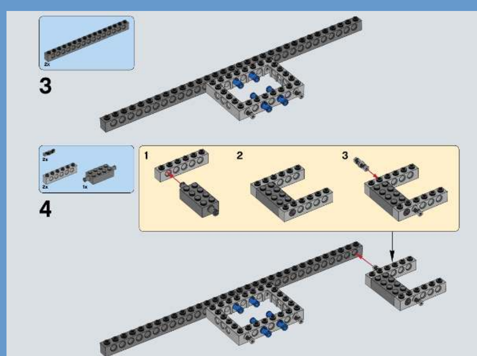
Phase

What we want is to reconstruct the image after the observations i.e., reassemble the pieces

FT

Amplitude

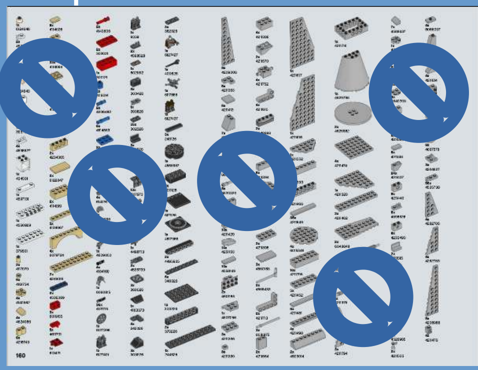
Phase



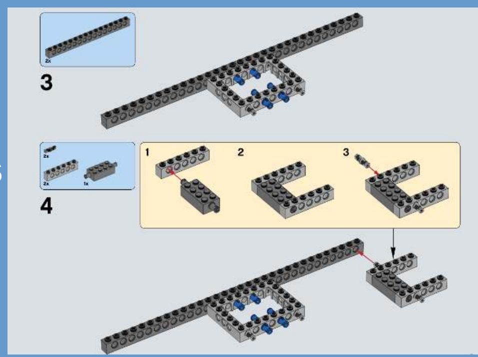
Problem:

Because of the filtering of the interferometer, we do not have all the pieces!

Amplitude



Phase



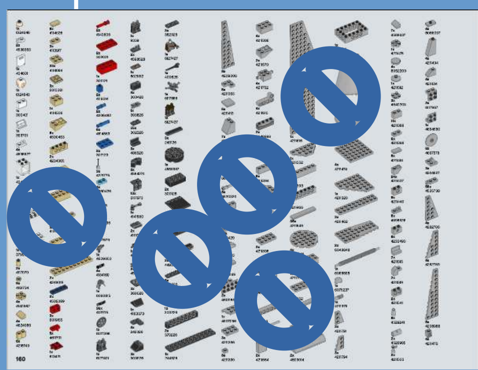
FT

Compact configuration:
= not seeing small pieces
= low resolution

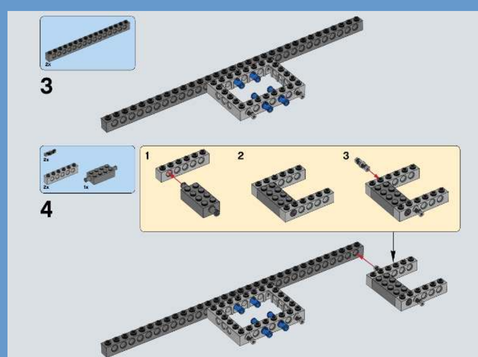
Problem:

Because of the filtering of the interferometer, we do not have all the pieces!

Amplitude



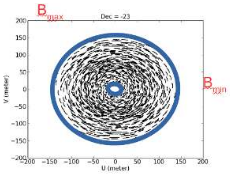
Phase



FT

Extended configuration
= loosing big pieces
= not seeing large structures

Problem of short spacings



$$V(u,v) = FT\,(I) = \iint I(x,y)\exp^{-i2\pi(ux+vy)}dxdy$$

#1 $V(0,0) = \iint I(x,y)dxdy$ = total flux of the source !

#2 No measurements for u,v inside a disk of radius B_{min}

= Loss of structures more extended than ~ λ/B_{min}

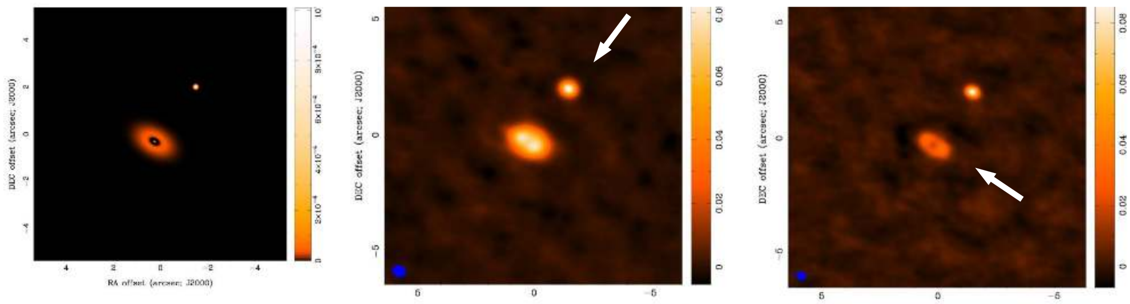
= Potential artefacts introduced into the reconstructed images

= Possible need for complementary data (smaller array, single dish)

The point source, the ring, and the large potato

Model source | Compact configuration | and | Excluding short baselines

1

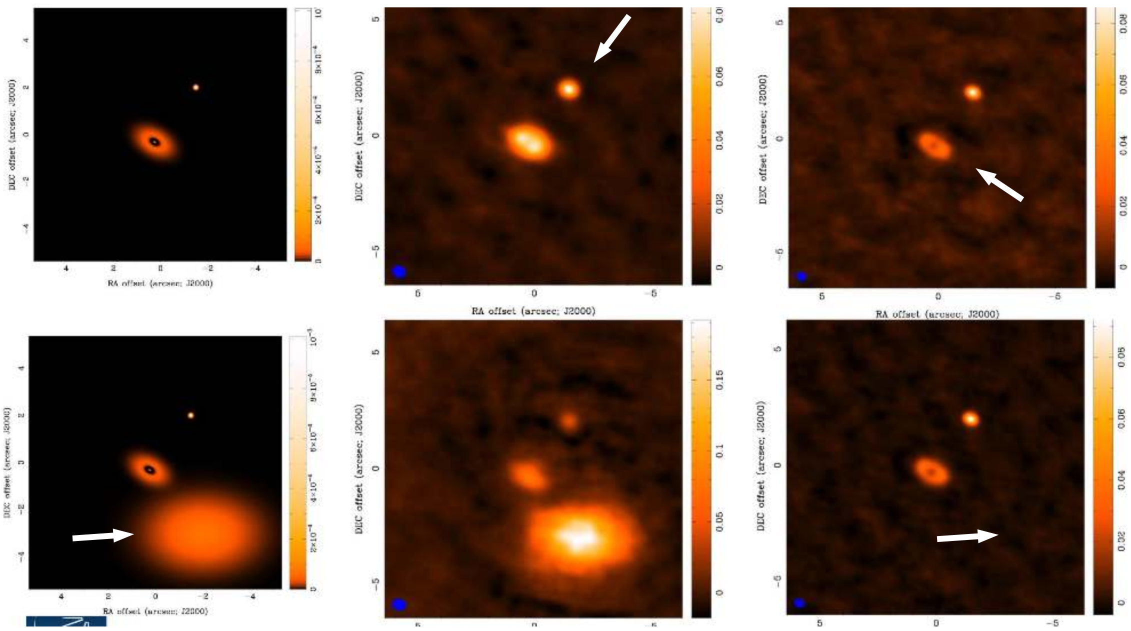


The point source, the ring, and the large potato

Model source | Compact configuration | and | Excluding short baselines

1

2

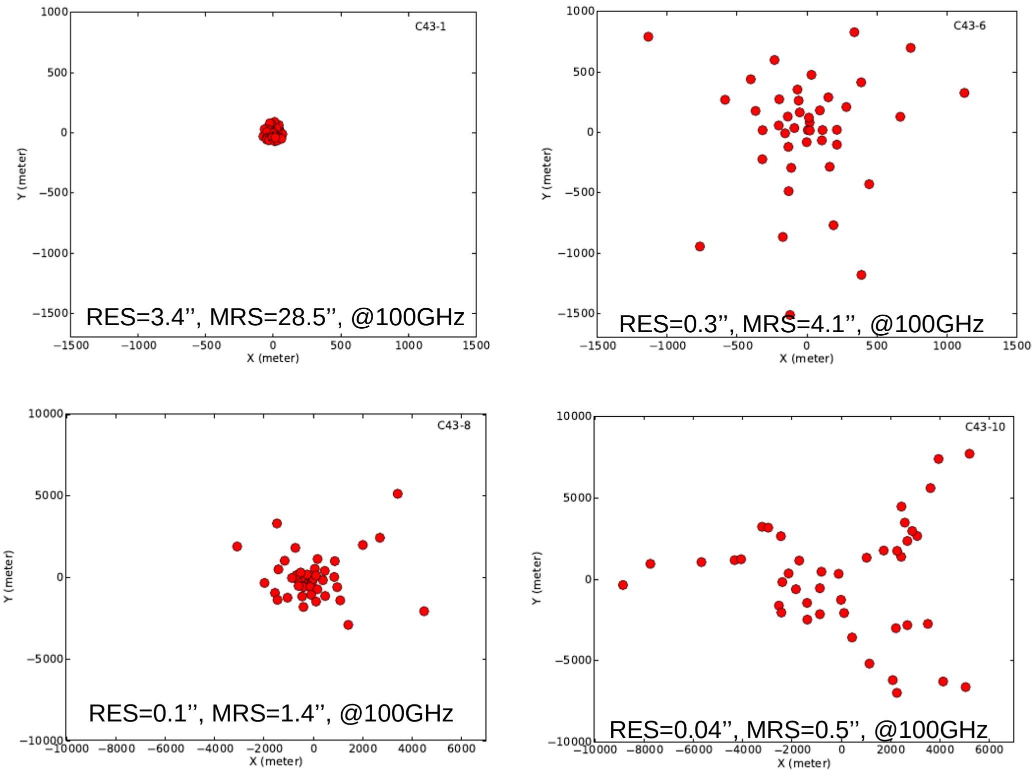


A few ALMA array configurations

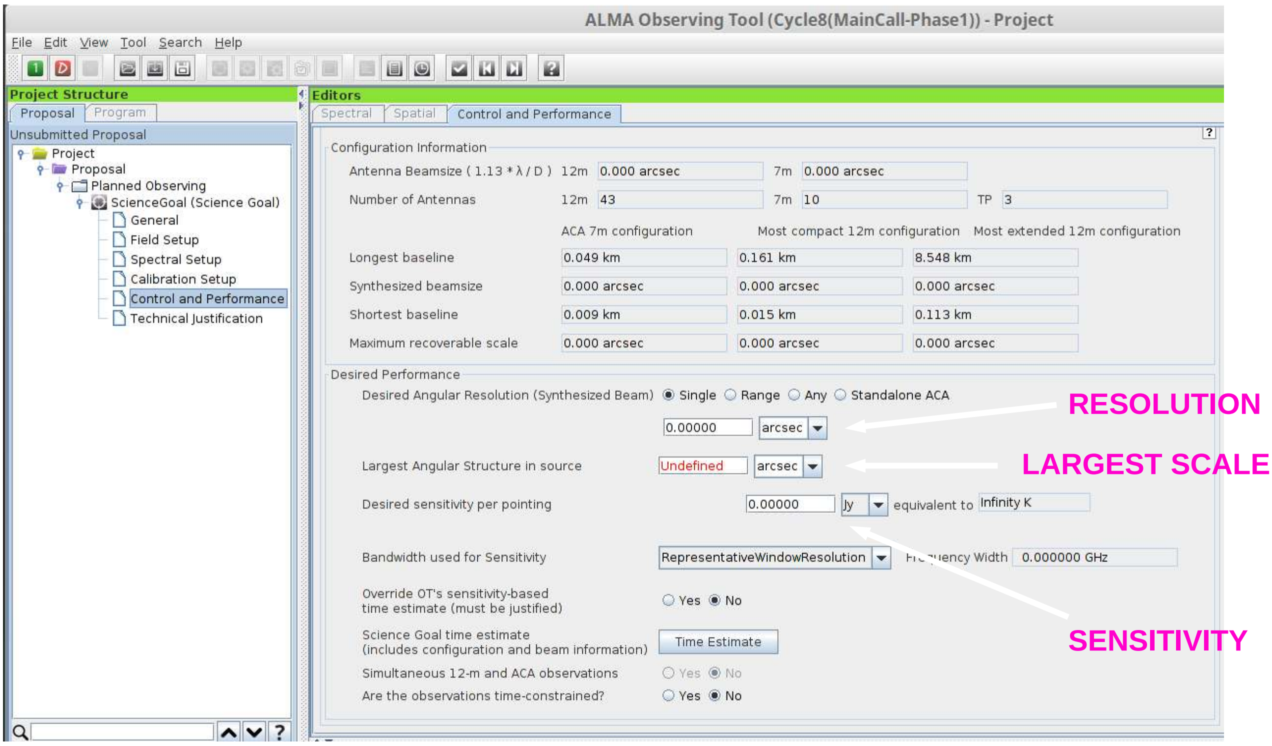
RES: beam resolution, MRS: maximum recoverable scale

Compact

Extended



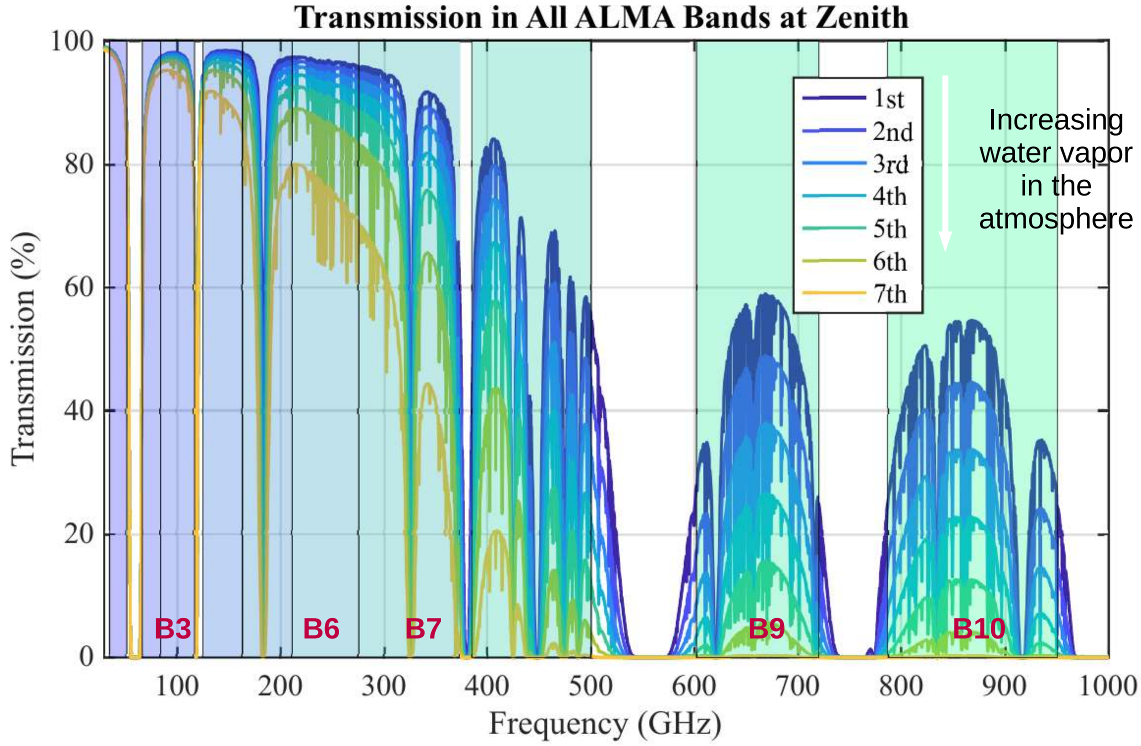
Don't worry, (basically) only 3 key input parameters in your ALMA proposal

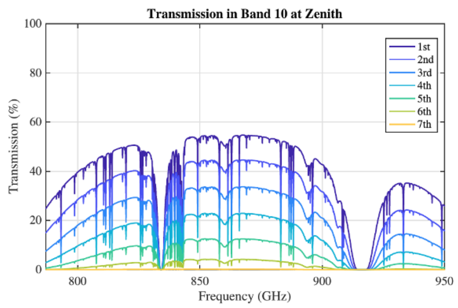


Outline

- Basic principles of interferometry
  - Visibilities, uv-plane
  - Problem of short spacings
- The effects of the atmosphere
  - Transmission in the mm/submm window
  - Phase stability
- [Calibration]
  - Flux accuracy
  - Bandpass calibration
  - Gains (amplitude and phase)
  - Astrometry

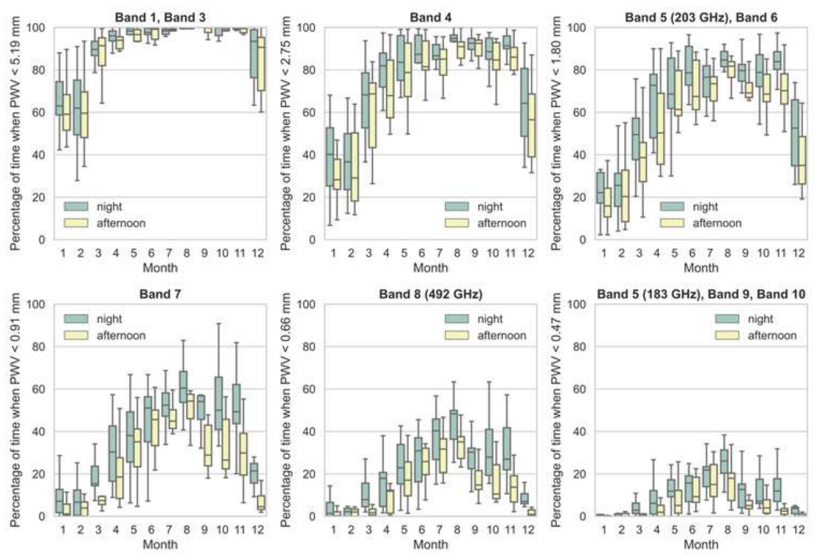
Atmospheric transmission @mm/submm





High frequencies (submm):

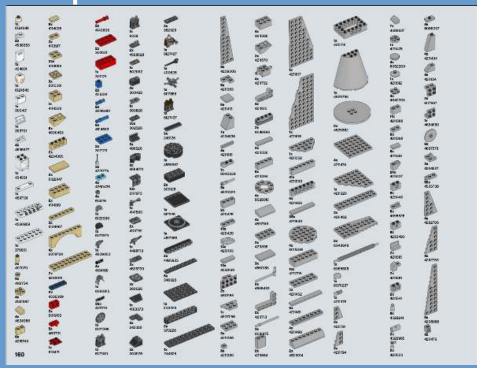
- Need extremely good weather:
  - Atmospheric transmission
  - Phase decoherence
- !! atmospheric lines
- Small FOV (limiting mosaic)
- Quasars are weaker, challenging calibration



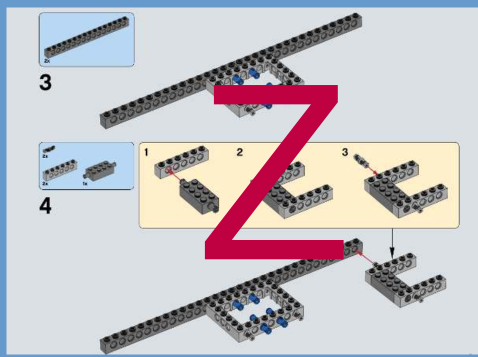
What we want is to reconstruct the image after the observations i.e., reassemble the pieces

FT

Amplitude



Phase



Phase instabilities introduce distorsions in the reconstructed image

Lego analogy
~ wrong assembling instructions

(Remedy: phase calibration, self-calibration)

Summary

- Interferometry is simple as a Lego game :-)
- An interferometer is a filter sampling spatial frequencies (small / extended structures) in your source
- Incomplete sampling ... some loss of information
- May or not have an impact on your science goals
- The Earth atmosphere alters our ability to reconstruct perfect images
- ALMA delivers very high-quality data

Slides - The ALMA archive

The ALMA archive in a nutshell

>12yr of ALMA observing

Data from Solar System to cosmology

>66000 public observations

>15000 not published yet ... all for you!

>4300 public projects

> 2 PB of data

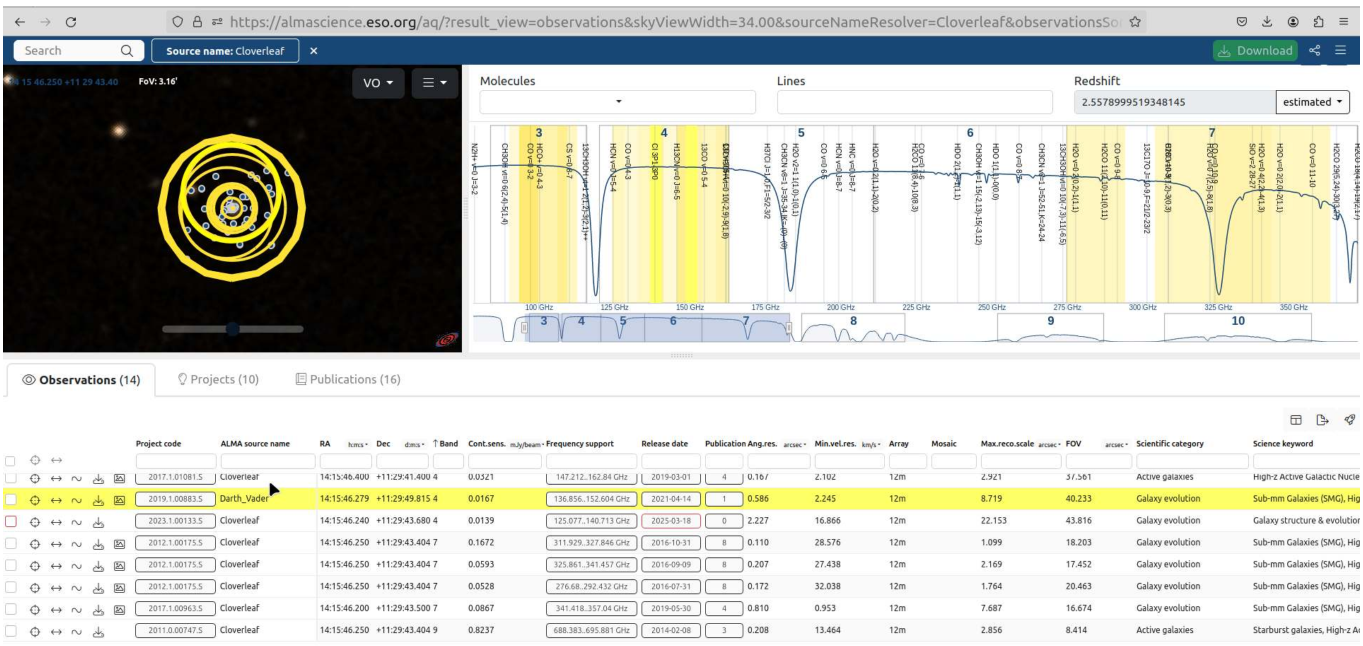
3980 publications (as of early December 2024)
>1/3 using archival data

Why using the ALMA archive?

- Check against **duplications** before submitting a proposal
- **Training** purpose
- Check feasibility of a project against similar targets
- Retrieve **more information** on a single target:
  different bands, configurations, epochs (variability), ...
- Retrieve statistics on a large sample of objects (e.g., stacking)
- **Data mining** (unpublished spectral lines,)

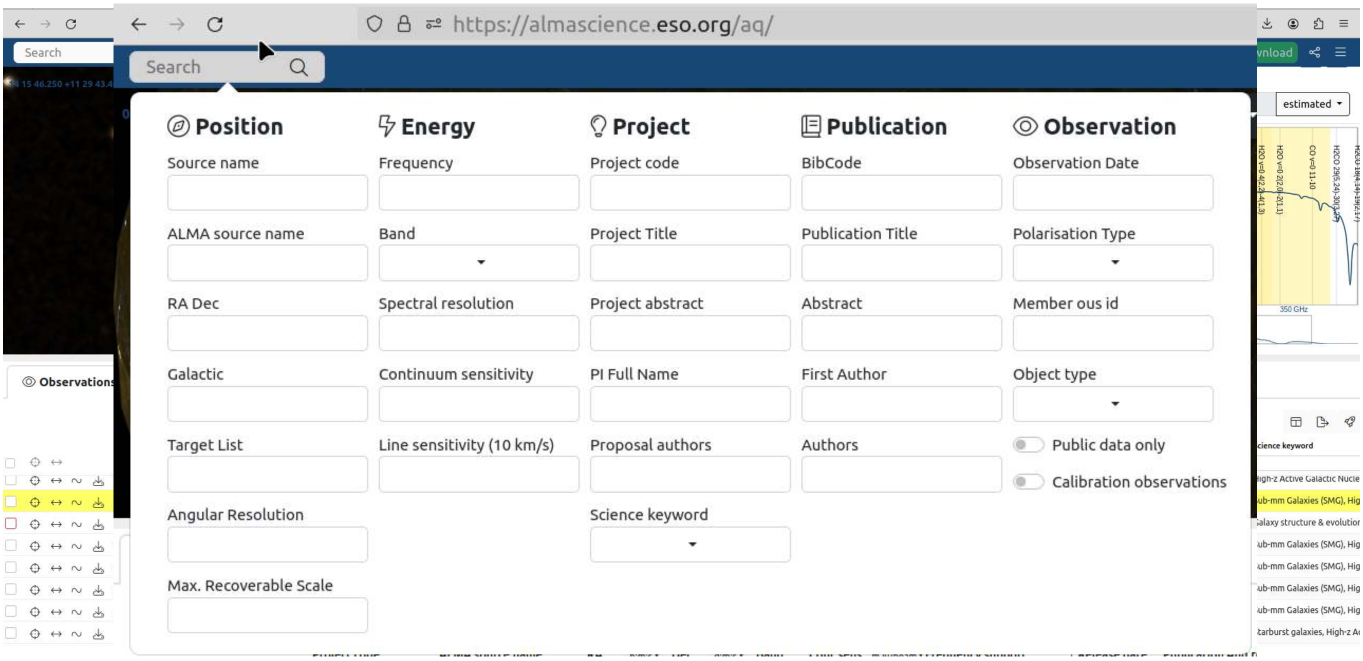
Query interface

https://almascience.eso.org/aq/

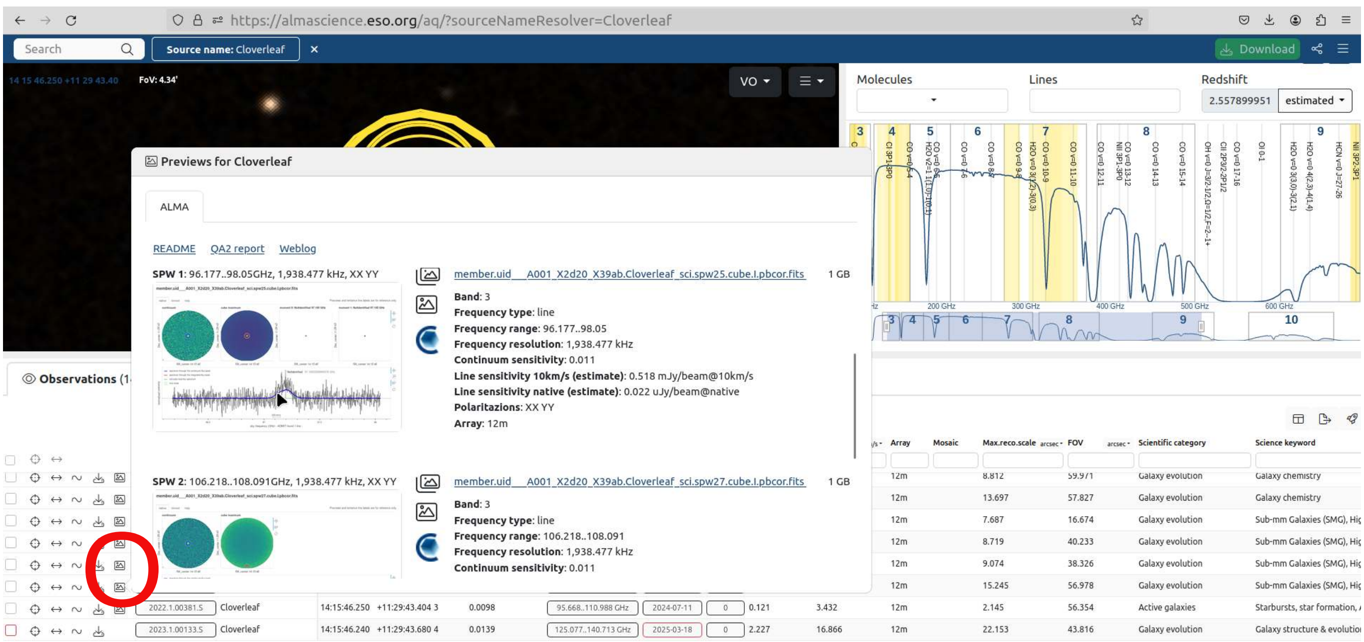


Search keywords

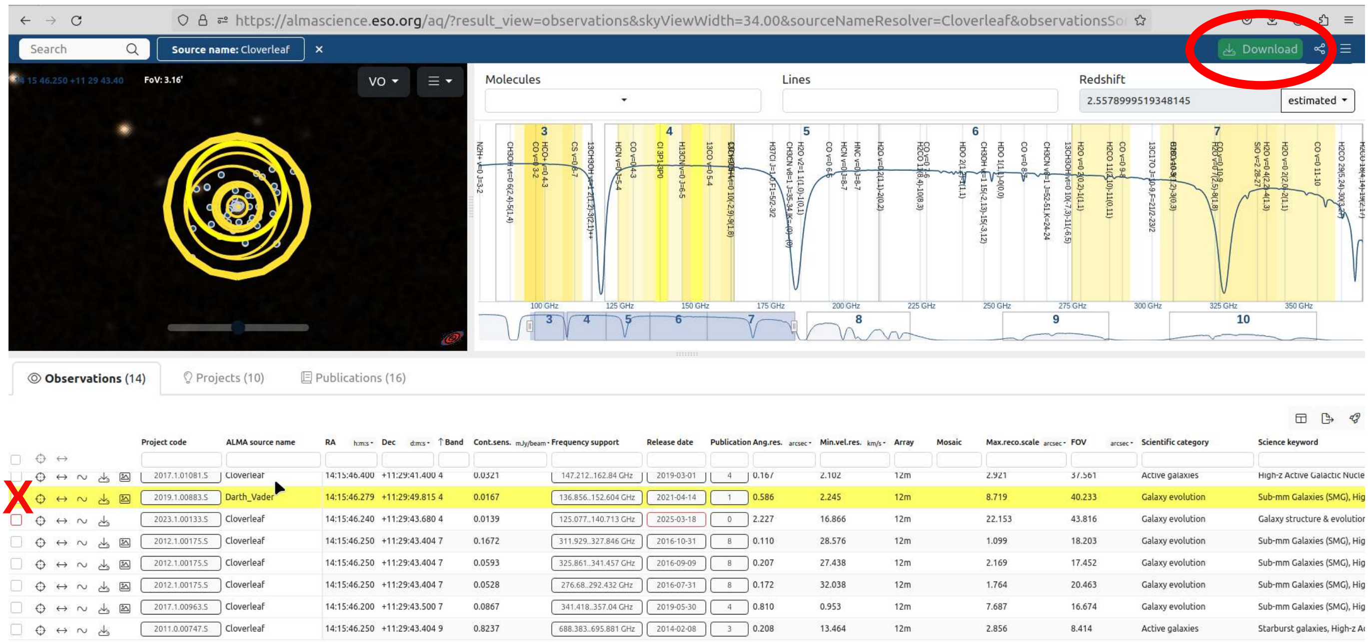
https://almascience.eso.org/aq/



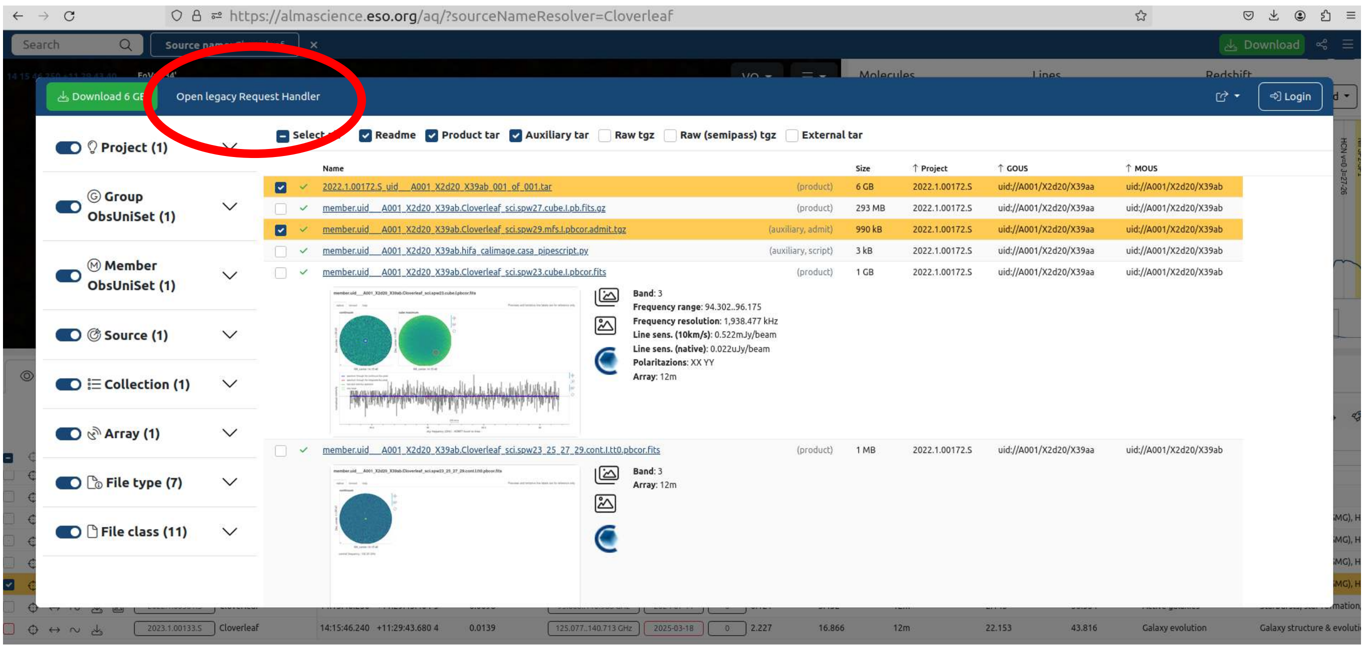
Explore (previews)



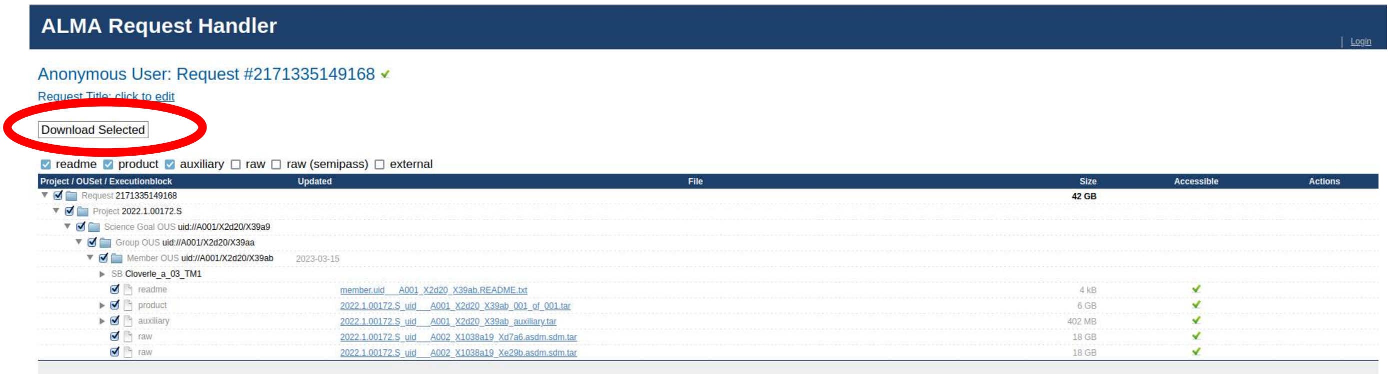
Downloading data



Downloading



Downloading



Select your data > Download (e.g., use "**Download script**")

Data structure

A typical package will unpack with a directory structure like:

```
2024.1.01234.S/                                              <- project code
    science_goal.uid___A001_X12345_X123/
        group.uid___A002_X6789ab_X6789/                      <- same fields, same tunings
            member.uid___A002_Xcdef1_X234/                   <- same array
```

containing the following directories (and a README):

calibrated	calibrated measurement sets
calibration	calibration and flags tables
log	CASA logs
product	FITS cubes
qa	QA2 reports, pipeline weblog
raw	raw data (asdm)
script	reduction script ***scriptForPI.py

Products

Images suffixes:

*pbcor.fits	... Primary-beam corrected image
*mask.fits	... Mask used when an image was created
*pb.fits or *.flux.fits	... Primary beam response for a field
*sd.im.fits	... Single-dish image

Filenames nomenclatura:

mfs.A. or *mfs.POLA*	... Polarization angle map
.mfs.P. or *mfs.POLI*	... Linear polarization intensity map
spw##.cube.I.	... Spectral image cube of a single spectral window
spw##.mfs.I.	... Continuum image for a single spectral window
spw##_##_##_##.cont.I.	... Aggregate bandwidth or continuum image
spw##_##_##_##.cont.I.alpha.	... Spectral index image
spw##_##_##_##.cont.I.tt0.	... Zeroth Taylor term for a continuum image
spw##_##_##_##.cont.I.tt1.	... First Taylor term for a continuum image
spw##_##_##_##.cont.IQUV.	... Aggregate bandwidth or continuum full Stokes

Restoring Calibrated Measurement Sets

Find the CASA version in the QA2 report

For the braves: restore the calibration using the **scriptForPI**

```
> casa --pipeline
CASA> execfile('member.uid___A001_X1296_Xe30.scriptForPI.py')
```

Use the **CalMS** service from EU ARC:

https://almascience.eso.org/tools/eu-arc-network/the-european-arc-calms-service

Fill an Helpdesk ticket in the department "Archive and Data Retrieval (EU)" select the "Data request" sub-category

Specify the project code (e.g., 2024.1.07777.S, one per ticket) and **MOUS UID(s)** (e.g. uid___A001_X340_X6 or uid://A001/X340/X6) (up to 10 MOUSs in your request)

Wait ~<24 hr and you will get an **email notifications** to download each MOUS tarred MSs

Make the data yours

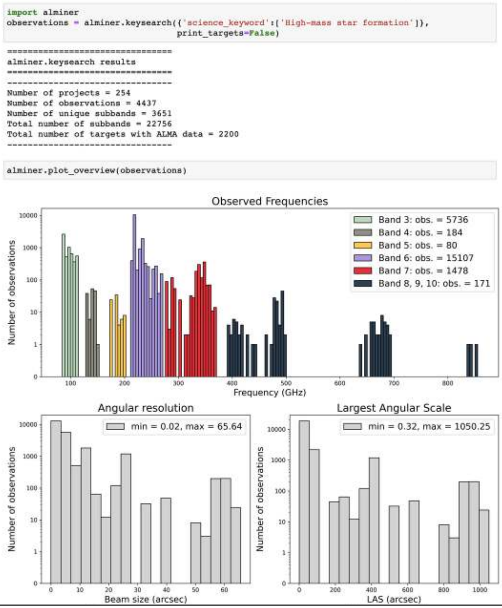
- Good idea to **inspect quality** of archival data
  Check weblog, QA0, QA2 reports
  Check visibilities: plotms

- Not all data have full imaging products or **match your needs**
  May need to adapt velocity and/or angular resolution, S/N ratio
  Mitigation for large cubes, large number of sources/science goal
  Array combination

- **Re-image** if needed:
  Imaging pipeline
  Use tclean
  Get help from your local ARC node!

ALMiner

ALMA archive mining and visualization toolkit



https://www.alma-allegro.nl/alminer/

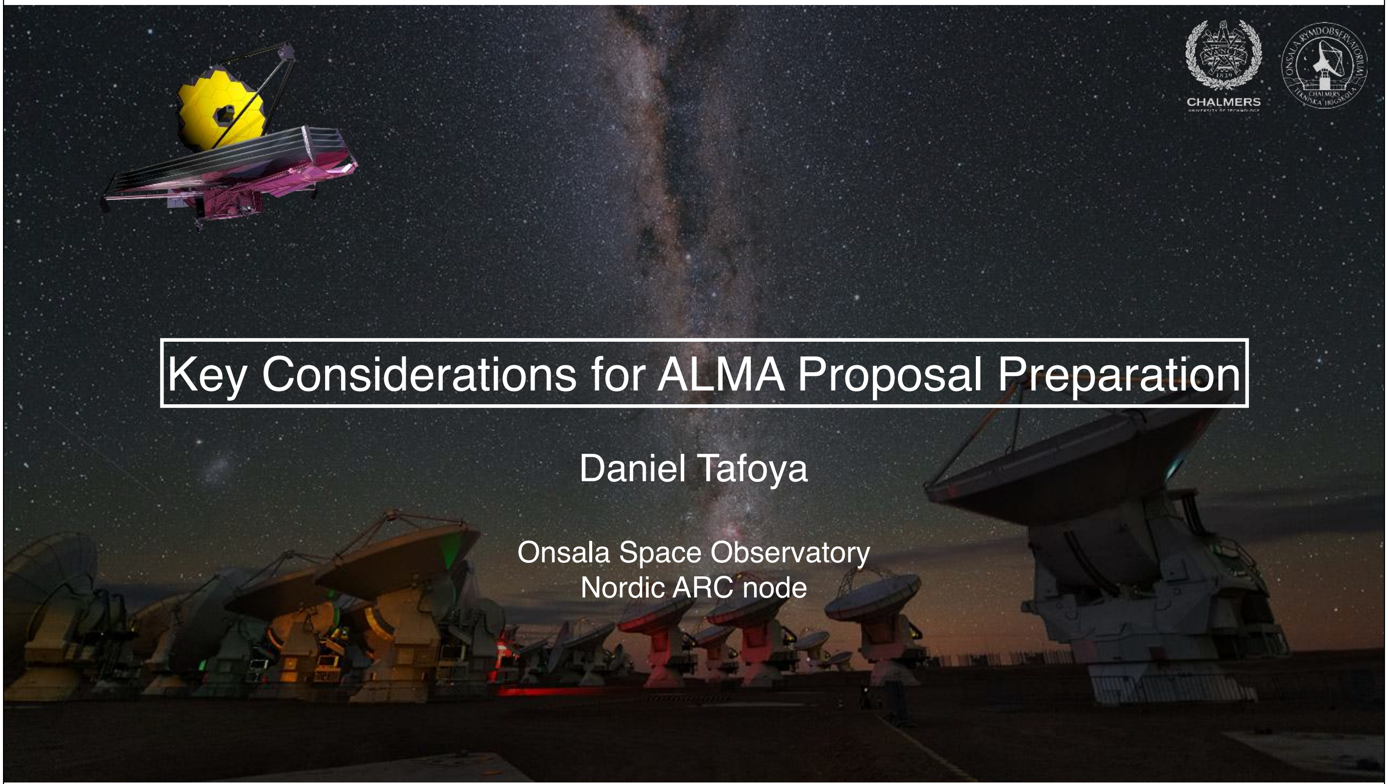
- **Query** a list of objects (name, coordinates, ...)
  by ALMA keywords, words in the abstract

- **Filter** and explore results of a query

- Make plots (frequencies,
  angular/spectral resolution,
  lines of interest, sky position,)

- **Download** data (raw, products, FITS cubes)

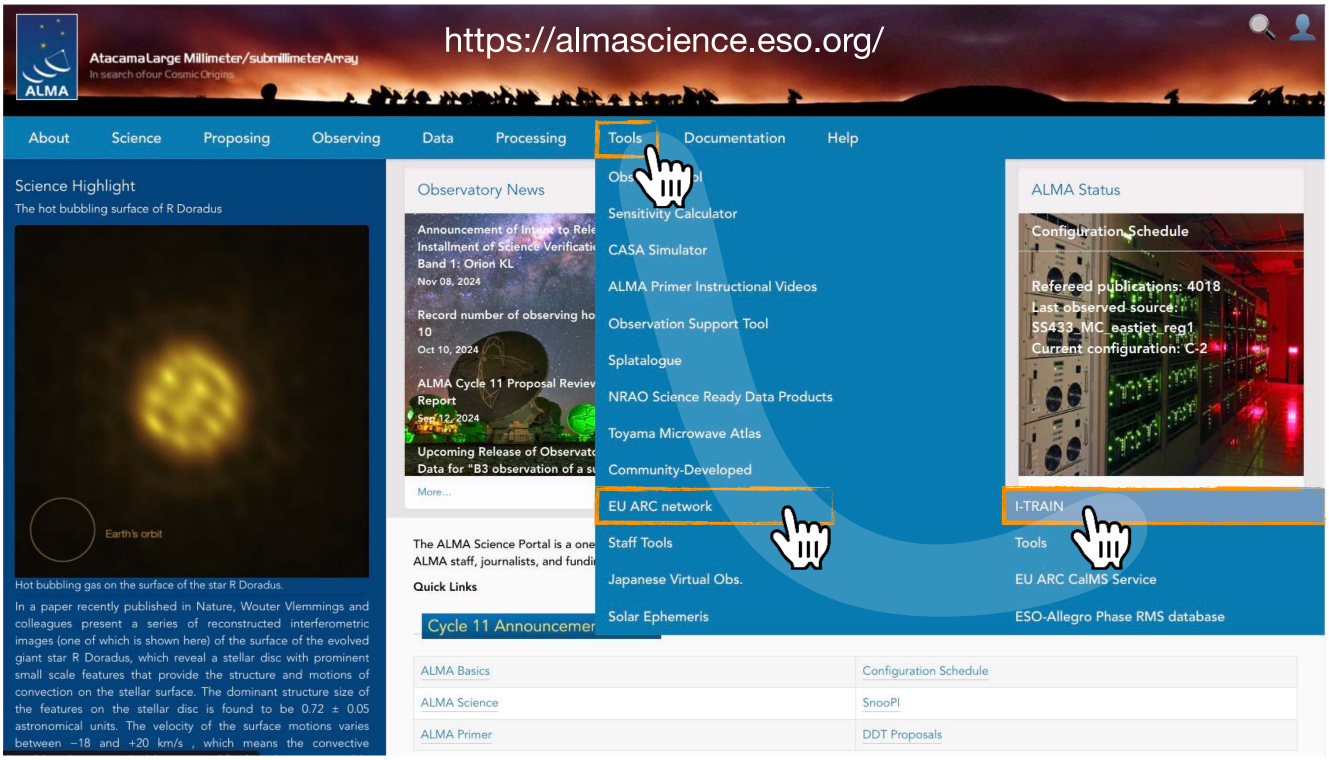
Slides - Preparing an ALMA Proposal

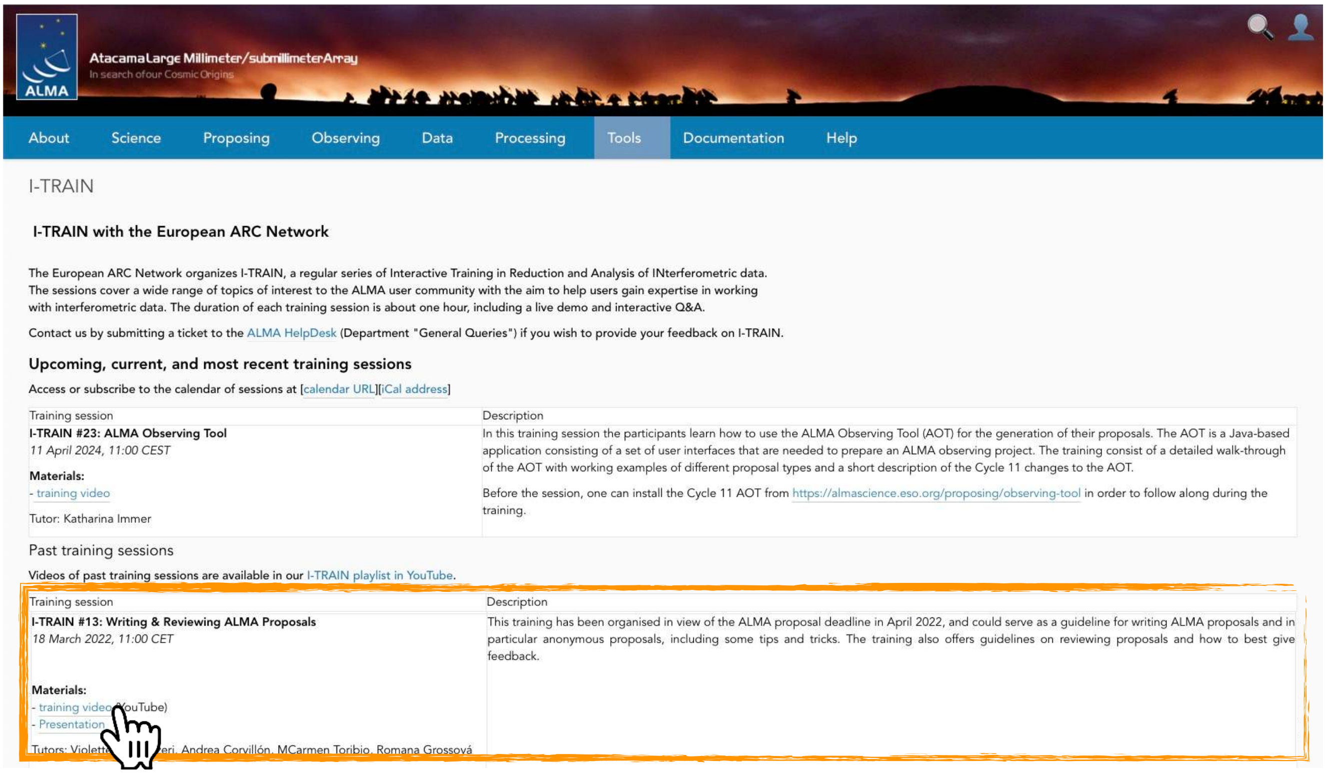


Key Considerations for ALMA Proposal Preparation

Daniel Tafoya

Onsala Space Observatory
Nordic ARC node




Atacama Large Millimeter/submillimeter Array
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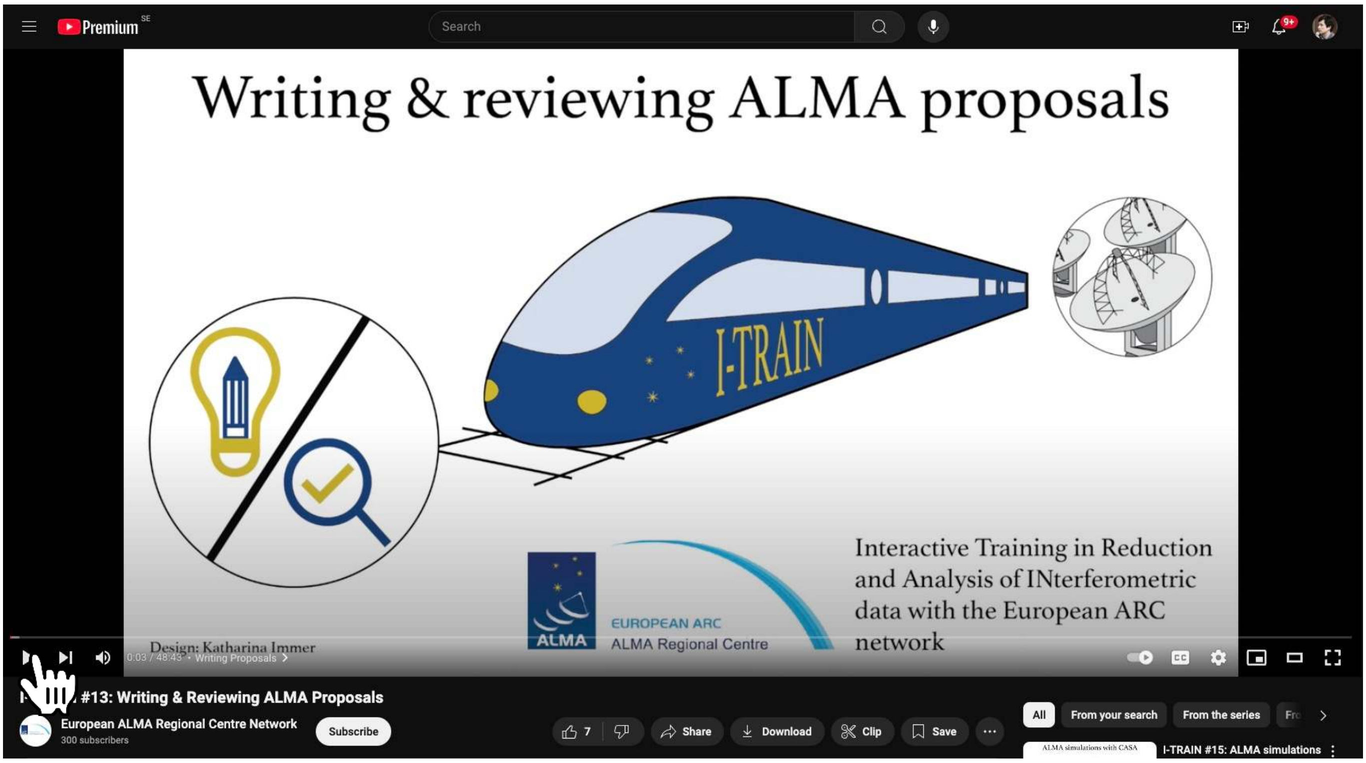
I-TRAIN
I-TRAIN with the European ARC Network
The European ARC Network organizes I-TRAIN, a regular series of Interactive Training in Reduction and Analysis of INterferometric data. The sessions cover a wide range of topics of interest to the ALMA user community with the aim to help users gain expertise in working with interferometric data. The duration of each training session is about one hour, including a live demo and interactive Q&A.
Contact us by submitting a ticket to the ALMA HelpDesk (Department "General Queries") if you wish to provide your feedback on I-TRAIN.
Upcoming, current, and most recent training sessions
Access or subscribe to the calendar of sessions at [calendar URL][iCal address]
Training session
Description
I-TRAIN #23: ALMA Observing Tool
11 April 2024, 11:00 CEST
Materials:
- training video
Tutor: Katharina Immer
In this training session the participants learn how to use the ALMA Observing Tool (AOT) for the generation of their proposals. The AOT is a Java-based application consisting of a set of user interfaces that are needed to prepare an ALMA observing project. The training consist of a detailed walk-through of the AOT with working examples of different proposal types and a short description of the Cycle 11 changes to the AOT.
Before the session, one can install the Cycle 11 AOT from https://almascience.eso.org/proposing/observing-tool in order to follow along during the training.
Past training sessions
Videos of past training sessions are available in our I-TRAIN playlist in YouTube.
Training session
Description
I-TRAIN #13: Writing & Reviewing ALMA Proposals
18 March 2022, 11:00 CET
Materials:
- training video (YouTube)
- Presentation
This training has been organised in view of the ALMA proposal deadline in April 2022, and could serve as a guideline for writing ALMA proposals and in particular anonymous proposals, including some tips and tricks. The training also offers guidelines on reviewing proposals and how to best give feedback.


Premium
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Writing & reviewing ALMA proposals
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Interactive Training in Reduction and Analysis of INterferometric data with the European ARC network
EUROPEAN ARC
ALMA Regional Centre
ALMA
Design: Katharina Immer
0:03 / 48:43 • Writing Proposals
#13: Writing & Reviewing ALMA Proposals
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I-TRAIN #15: ALMA simulations

How to Write & Review ALMA proposals

Violette Impellizzeri (Allegro Arc Node)
Carmen Toribio (Nordic Arc Node)

& the Proposal Handling Team (JAO)

Andrea Corvillon, John Carpenter

Part 1:
Writing an ALMA proposal!

Part 2:
Reviewing an ALMA proposal!

Part 1:
Writing an ALMA proposal!

Have a good idea!

- Is the idea clear to you?
- What question will you address? What will you learn?
- Why should others care?

- If you are not excited, neither will be the reviewer.

Have a good idea!

- Is the idea clear to you?
- What question will you address? What will you learn?
- Why should others care?

Be excited!

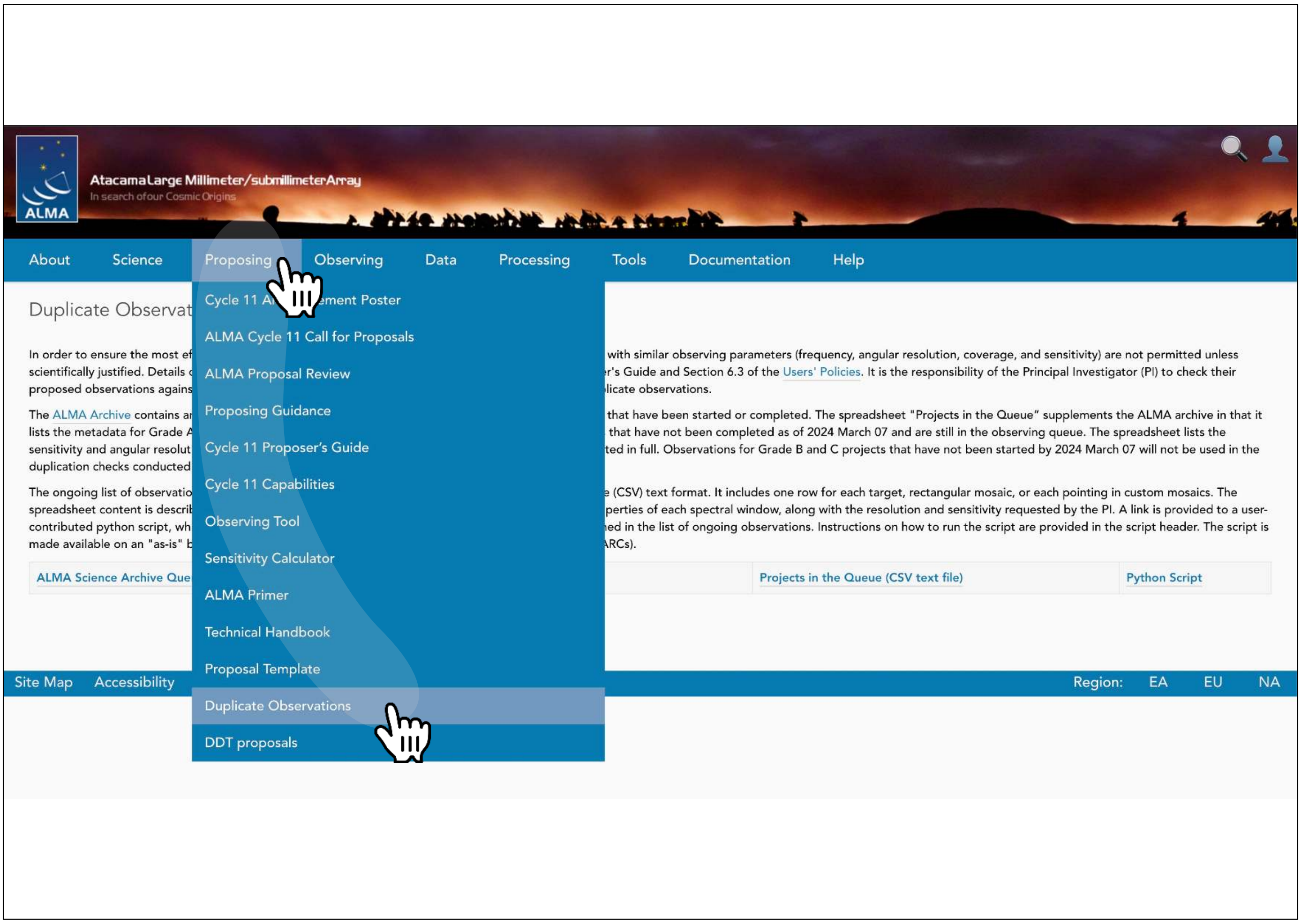
- If you are not excited, neither will be the reviewer.

Research your idea

Has it been done already?

Read the literature and the abstracts of accepted proposals

Search the ALMA archive or the observing queue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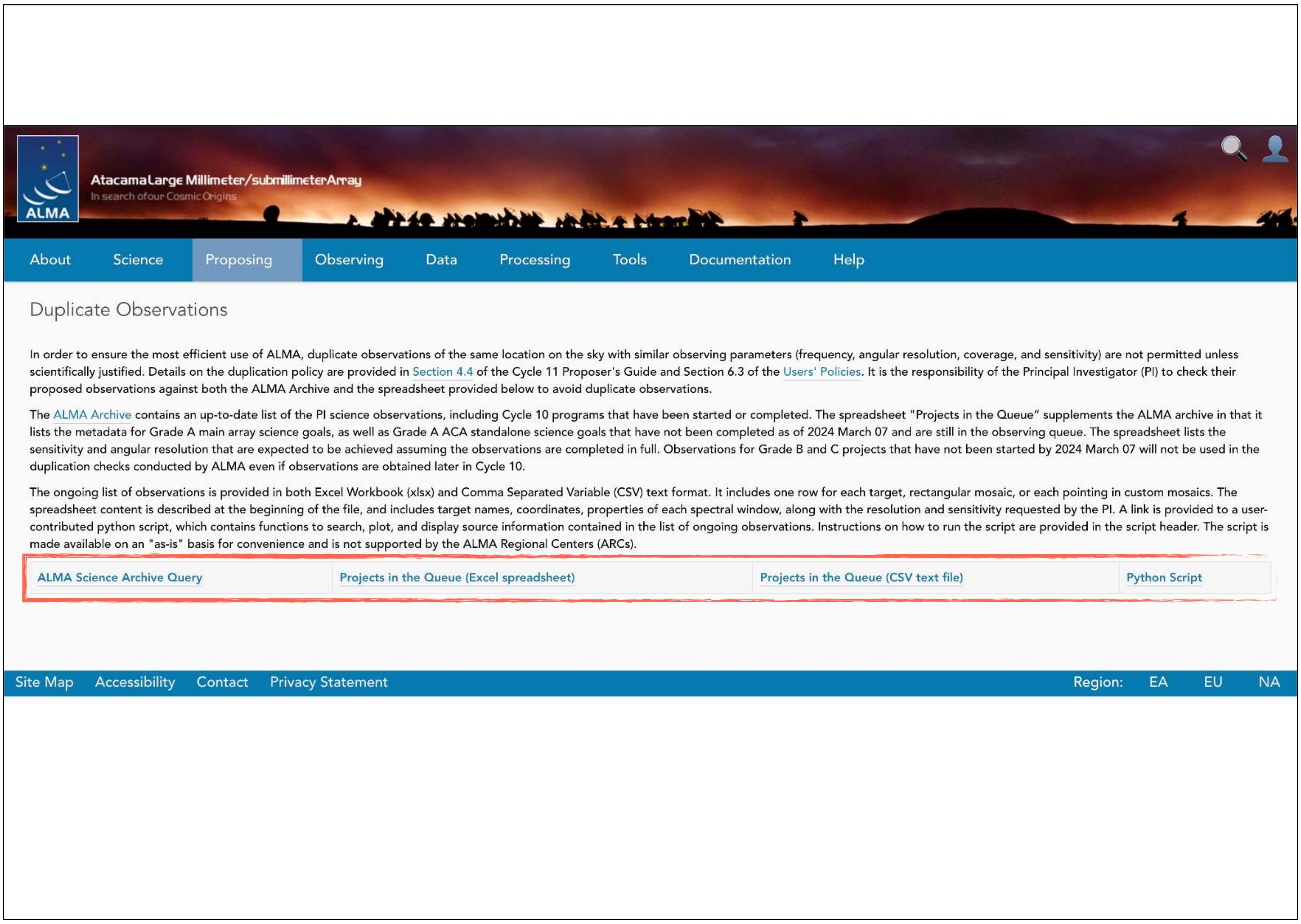
ALMA Cycle 11 Call for Proposals
ALMA Proposal Review
Proposing Guidance
Cycle 11 Proposer's Guide
Cycle 11 Capabilities
Observing Tool
Sensitivity Calculator
ALMA Primer
Technical Handbook
Proposal Template
Duplicate Observations
DDT proposals
Projects in the Queue (CSV text file)
Python Script
Site Map
Accessibility
Region:
EA
EU
NA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Duplicate Observations
In order to ensure the most efficient use of ALMA, duplicate observations of the same location on the sky with similar observing parameters (frequency, angular resolution, coverage, and sensitivity) are not permitted unless scientifically justified. Details on the duplication policy are provided in Section 4.4 of the Cycle 11 Proposer's Guide and Section 6.3 of the Users' Policies. It is the responsibility of the Principal Investigator (PI) to check their proposed observations against both the ALMA Archive and the spreadsheet provided below to avoid duplicate observations.
The ALMA Archive contains an up-to-date list of the PI science observations, including Cycle 10 programs that have been started or completed. The spreadsheet "Projects in the Queue" supplements the ALMA archive in that it lists the metadata for Grade A main array science goals, as well as Grade A ACA standalone science goals that have not been completed as of 2024 March 07 and are still in the observing queue. The spreadsheet lists the sensitivity and angular resolution that are expected to be achieved assuming the observations are completed in full. Observations for Grade B and C projects that have not been started by 2024 March 07 will not be used in the duplication checks conducted by ALMA even if observations are obtained later in Cycle 10.
The ongoing list of observations is provided in both Excel Workbook (xlsx) and Comma Separated Variable (CSV) text format. It includes one row for each target, rectangular mosaic, or each pointing in custom mosaics. The spreadsheet content is described at the beginning of the file, and includes target names, coordinates, properties of each spectral window, along with the resolution and sensitivity requested by the PI. A link is provided to a user-contributed python script, which contains functions to search, plot, and display source information contained in the list of ongoing observations. Instructions on how to run the script are provided in the script header. The script is made available on an "as-is" basis for convenience and is not supported by the ALMA Regional Centers (ARCs).
ALMA Science Archive Query
Projects in the Queue (Excel spreadsheet)
Projects in the Queue (CSV text file)
Python Script
Site Map
Accessibility
Contact
Privacy Statement
Region:
EA
EU
NA

Duplicate Observations

In order to ensure the most efficient use of ALMA, duplicate observations of the same location on the sky with similar observing parameters (frequency, angular resolution, coverage, and sensitivity) are not permitted unless scientifically justified. Details on the duplication policy are provided in Section 4.4 of the Cycle 11 Proposer's Guide and Section 6.3 of the Users' Policies. It is the responsibility of the Principal Investigator (PI) to check their proposed observations against both the ALMA Archive and the spreadsheet provided below to avoid duplicate observations.

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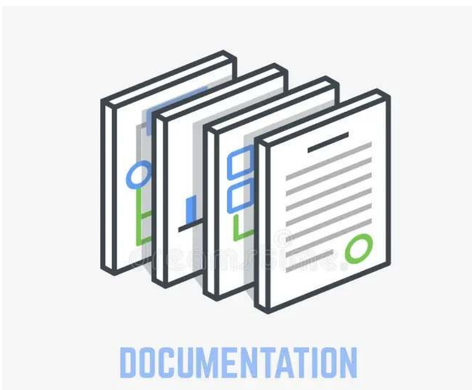
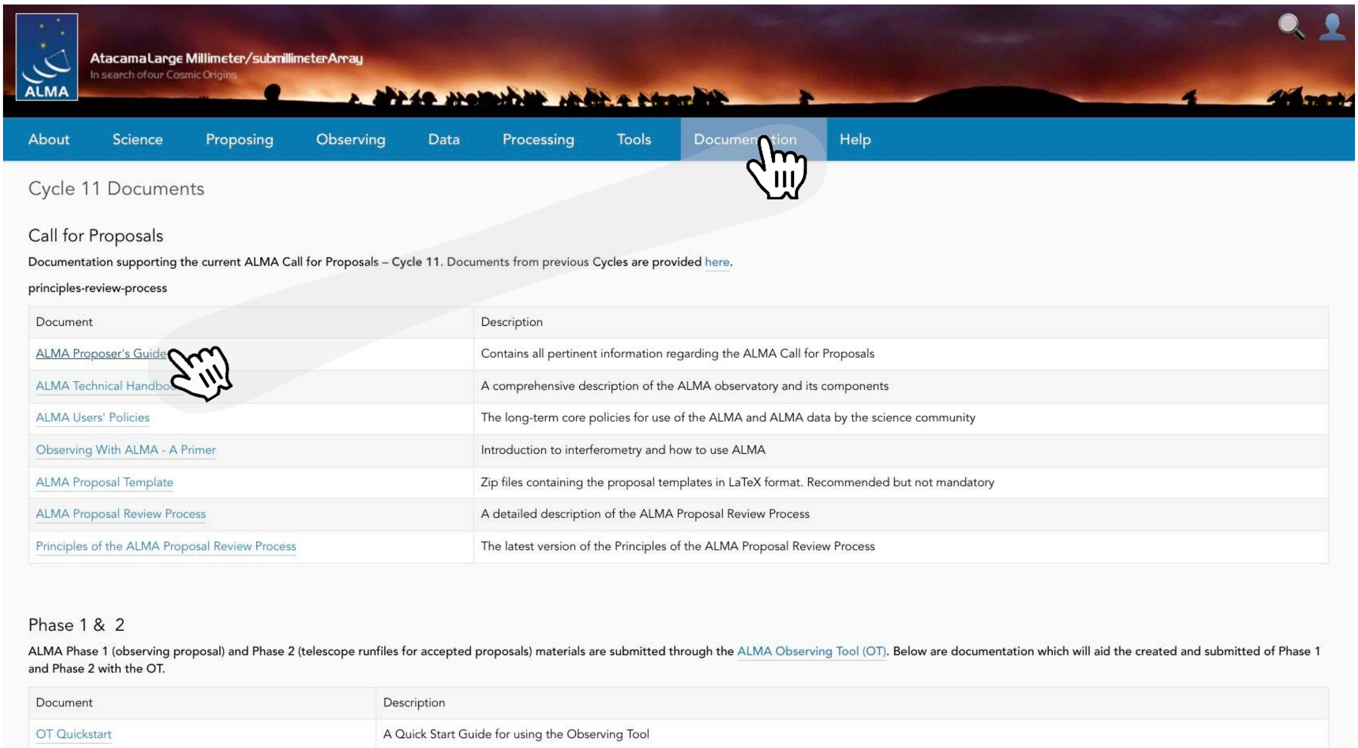
ALMA Science Archive Query	Projects in the Queue (Excel spreadsheet)	Projects in the Queue (CSV text file)	Python Script

Contact the ARC Node for help!!!

Site Map Accessibility Contact Privacy Statement Region: EA EU NA

Read the documentation

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ALMA

About | Science | Proposing | Observing | Data | Processing | Tools | Documentation | Help

Cycle 11 Documents

Call for Proposals

Documentation supporting the current ALMA Call for Proposals – Cycle 11. Documents from previous Cycles are provided here.

principles-review-process

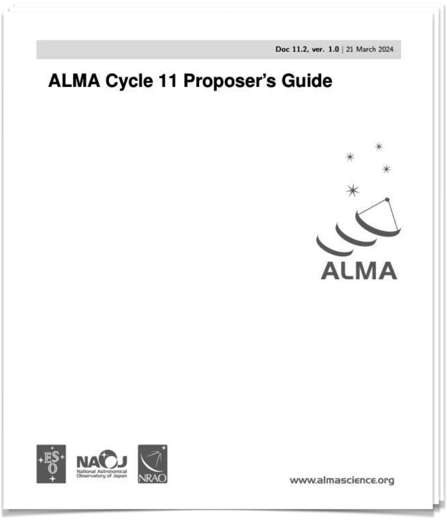
Document	Description
ALMA Proposer's Guide	Contains all pertinent information regarding the ALMA Call for Proposals
ALMA Technical Handbo[...]	A comprehensive description of the ALMA observatory and its components
ALMA Users' Policies	The long-term core policies for use of the ALMA and ALMA data by the science community
Observing With ALMA - A Primer	Introduction to interferometry and how to use ALMA
ALMA Proposal Template	Zip files containing the proposal templates in LaTeX format. Recommended but not mandatory
ALMA Proposal Review Process	A detailed description of the ALMA Proposal Review Process
Principles of the ALMA Proposal Review Process	The latest version of the Principles of the ALMA Proposal Review Process

Phase 1 & 2

ALMA Phase 1 (observing proposal) and Phase 2 (telescope runfiles for accepted proposals) materials are submitted through the ALMA Observing Tool (OT). Below are documentation which will aid the created and submitted of Phase 1 and Phase 2 with the OT.

Document	Description
OT Quickstart	A Quick Start Guide for using the Observing Tool

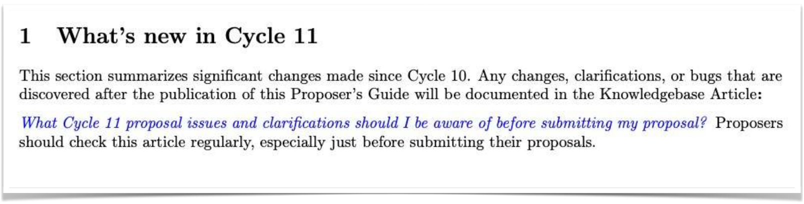
Read the documentation


Doc 11.2, ver. 1.0 | 21 March 2024

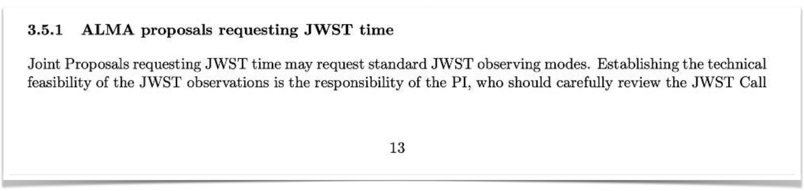
ALMA Cycle 11 Proposer's Guide

ALMA

www.almascience.org


1 What's new in Cycle 11

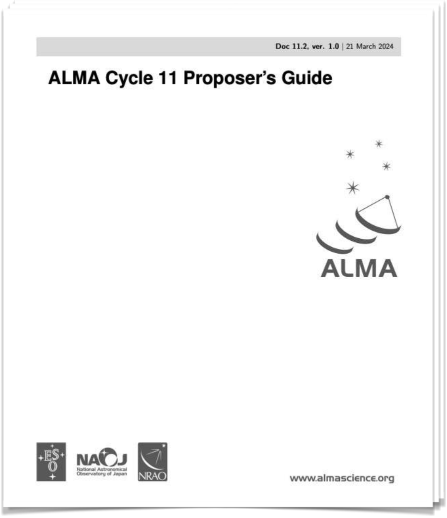
This section summarizes significant changes made since Cycle 10. Any changes, clarifications, or bugs that are discovered after the publication of this Proposer's Guide will be documented in the Knowledgebase Article: *What Cycle 11 proposal issues and clarifications should I be aware of before submitting my proposal?* Proposers should check this article regularly, especially just before submitting their proposals.


3.5.1 ALMA proposals requesting JWST time

Joint Proposals requesting JWST time may request standard JWST observing modes. Establishing the technical feasibility of the JWST observations is the responsibility of the PI, who should carefully review the JWST Call

13

Read the documentation

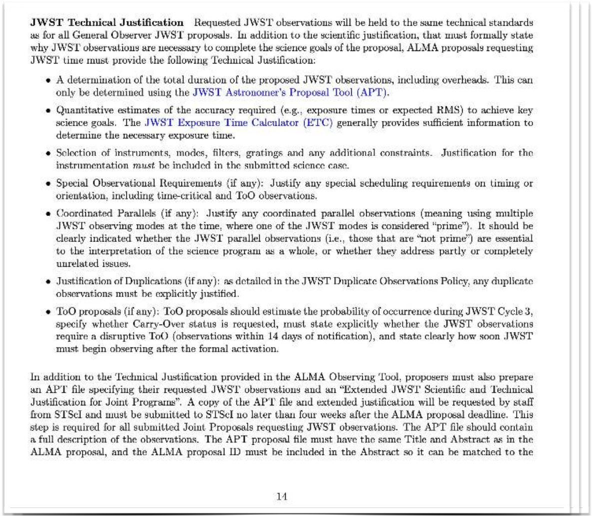


Doc 11.2, ver. 1.0 | 21 March 2024

ALMA Cycle 11 Proposer's Guide

ALMA

www.almascience.org



JWST Technical Justification Requested JWST observations will be held to the same technical standards as for all General Observer JWST proposals. In addition to the scientific justification, that must formally state why JWST observations are necessary to complete the science goals of the proposal, ALMA proposals requesting JWST time must provide the following Technical Justification:

- A determination of the total duration of the proposed JWST observations, including overheads. This can only be determined using the JWST Astronomer's Proposal Tool (APT).
- Quantitative estimates of the accuracy required (e.g., exposure times or expected RMS) to achieve key science goals. The JWST Exposure Time Calculator (ETC) generally provides sufficient information to determine the necessary exposure time.
- Selection of instruments, modes, filters, gratings and any additional constraints. Justification for the instrumentation *must* be included in the submitted science case.
- Special Observational Requirements (if any): Justify any special scheduling requirements on timing or orientation, including time-critical and ToO observations.
- Coordinated Parallels (if any): Justify any coordinated parallel observations (meaning using multiple JWST observing modes at the time, where one of the JWST modes is considered "prime"). It should be clearly indicated whether the JWST parallel observations (i.e., those that are "not prime") are essential to the interpretation of the science program as a whole, or whether they address partly or completely unrelated issues.
- Justification of Duplications (if any): as detailed in the JWST Duplicate Observations Policy, any duplicate observations must be explicitly justified.
- ToO proposals (if any): ToO proposals should estimate the probability of occurrence during JWST Cycle 3, specify whether Carry-Over status is requested, must state explicitly whether the JWST observations require a disruptive ToO (observations within 14 days of notification), and state clearly how soon JWST must begin observing after the formal activation.

In addition to the Technical Justification provided in the ALMA Observing Tool, proposers must also prepare an APT file specifying their requested JWST observations and an "Extended JWST Scientific and Technical Justification for Joint Programs". A copy of the APT file and extended justification will be requested by staff from STScI and must be submitted to STScI no later than four weeks after the ALMA proposal deadline. This step is required for all submitted Joint Proposals requesting JWST observations. The APT file should contain a full description of the observations. The APT proposal file must have the same Title and Abstract as in the ALMA proposal, and the ALMA proposal ID must be included in the Abstract so it can be matched to the

14

Identify the goals of the proposal

Get the reviewer excited about your idea!

Reviewer perspective

- What is the goal of the proposal?
- Why is this important?
- How are they are going to achieve it?
- Why is this proposal more important than the other proposals?

Help the reviewer

- reviewers will need to read 10+ proposals - make it easy for them!
- importance should be understandable to a non-expert
- proposal needs to be clear, concise, and explicit
  - avoid acronyms and jargon, or at least define them
  - do not assume the reviewer will infer your point: say it directly!

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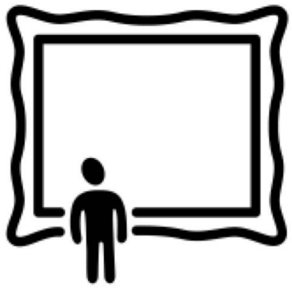
Know your audience

Reviewers knowledgeable but
not necessarily experts



Give big picture on why
your proposal is important

Understand the review criteria

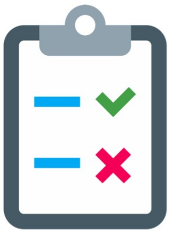
Overall scientific merit

- Does the proposal clearly indicate which important, outstanding questions will be addressed?
- Will the proposed observations have a high scientific impact on this particular field and address the specific science goals of the proposal?
- Does the proposal present a clear and appropriate data analysis plan?

Suitability of the observations to achieve the scientific goals

- Is the choice of target (or targets) clearly described and well justified?
- Are the requested signal-to-noise ratio, angular resolution, spectral setup, and u-v coverage sufficient to achieve the science goals?

Understand the review criteria



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Proposal components

Abstract

Scientific Justification

Technical Justification

Proposal components

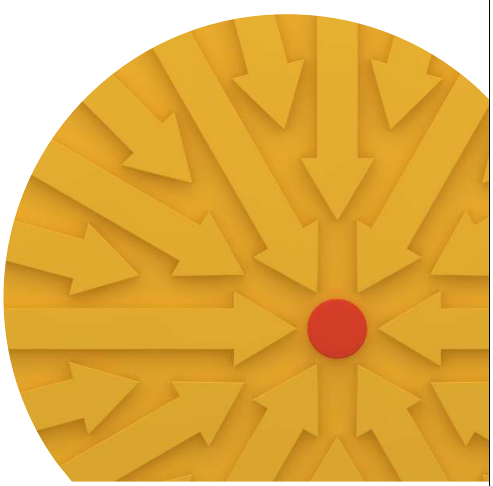
Abstract

Scientific Justification

Technical Justification

Abstract

Briefly and powerfully convey the big picture, the problem, the observations proposed, and the goals of the proposal.



Abstract structure example

Proposal 2019.1.00061.S, PI: Richard Ellis

Determining the period when the first galaxies emerged from a dark intergalactic medium represents a fundamental milestone in assembling a coherent picture of cosmic history. Recent surveys of z~7-9 galaxies have revealed a population whose red Spitzer IRAC colours either indicate contamination from intense optical emission lines or the presence of a Balmer break due to a mature stellar population. Accurate redshifts are needed to distinguish between these two hypotheses. One example was confirmed via [O III] emission with ALMA at z=9.11 whose Balmer break indicates the onset of star formation occurred as early as z~15±2. We propose to follow up the only further similar z~9 candidate accessible with ALMA to determine if this initial result is a representative indicator of when galaxies first emerged from the Dark Ages.

Background

Problem

Objective

Strategy

Significance

The abstract should convey these elements, but the order can vary. Many PIs start with “We propose…”

Abstract

- The abstract should offer a concise, clear and coherent narrative that will excite the reviewers about your project
  - Do not copy portions of the science justifications into the abstract
  - And do not repeat the Abstract in the science justification (space is precious!)

Proposal components

Abstract → **Scientific Justification** Technical Justification

Science Justification: example outline

Introduction (1 page)

- big picture
- specific problem to be solved
- previous work and unsolved issues
- summary of what you propose to do

4 pages total
~ 2 pages for text
~ 2 pages for figures / tables
=> must be concise!

Methodology (2.5 pages)

- what will you observe and why
- what data you need
- analytic techniques
- plan for interpreting the results and expected impact

Description of observations (0.5 pages)

- salient points only; refer to Technical Justification for details

Science Justification: Motivation

What will you do with ALMA?

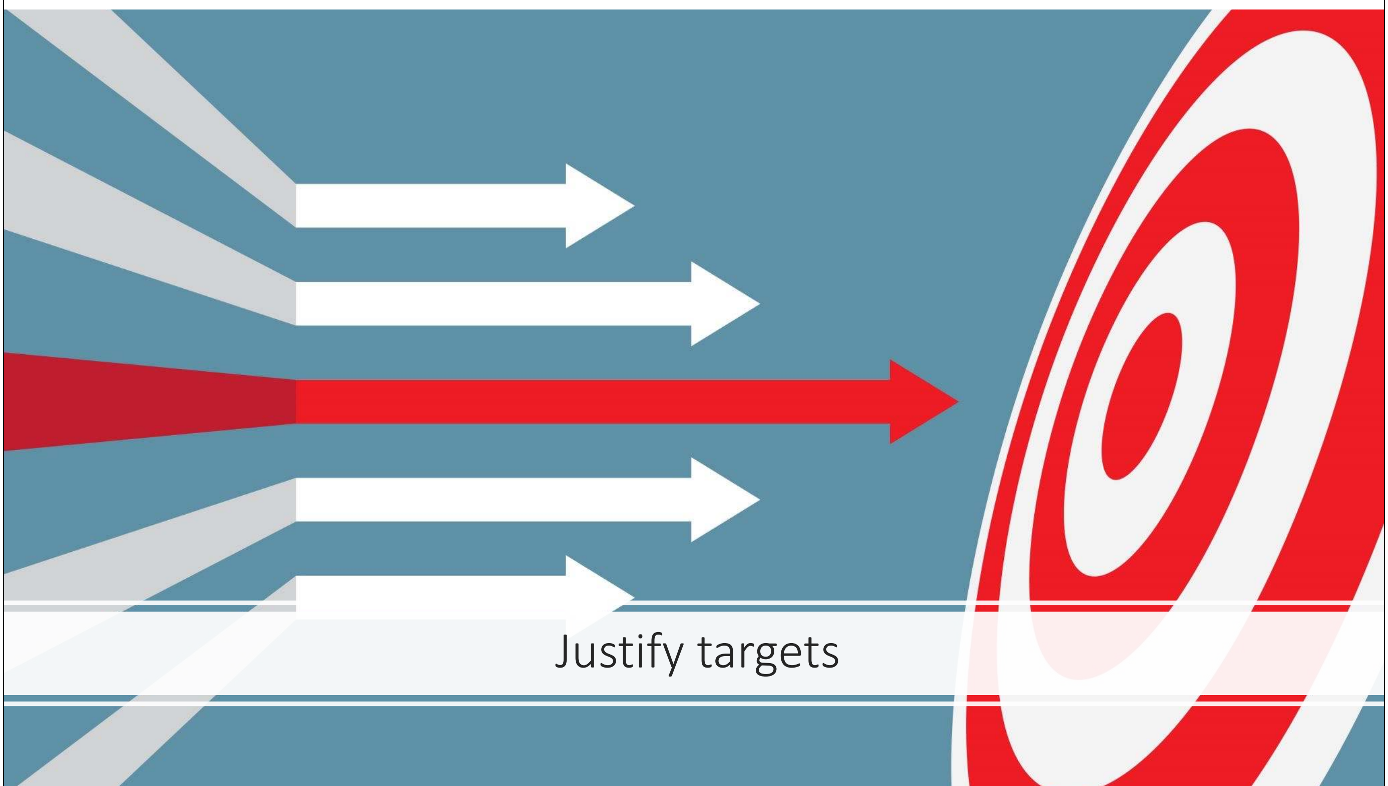
- present specific goals
- describe source(s) to be observed
- requested ALMA data

How will you analyze the data?

- describe analysis techniques / models
- ALMA/CASA simulations are often useful

Expected results and impact

- common (and successful) formula:
  - observe X => prefer model A
  - observe Y => prefer model B



Why is this the **best** source(s) to observe to achieve the science goals?

- closest, to provide the best spatial resolution?
- brightest, to provide the best signal to noise?
- unique?
- wealth of ancillary data?

Justify targets

Survery proposals

List clear, explicit selection criteria.

- we selected all sources in Taurus
  - brighter than 10 mJy in the continuum and
  - spectral types between M6 and M9 and
  - no known binary companion

Justify the sample size! Reviewers like…

- complete samples
  - all sources brighter than …
- samples that tie to a quantitative, statistical measure
  - by observing 20 sources we can measure the slope of the mass-luminosity to accuracy of 10%
- samples that extend previous observations by a lot (e.g. 10 times more objects)

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Detection experiments

Aim for a significant detection (at least 3 sigma, if not higher)

- 2 sigma detection will not convince anyone

If source is not detected, explain the implications of an upper limit and why it is important.

Detection experiments

Figures

Figures should be simple and clearly convey a significant point.

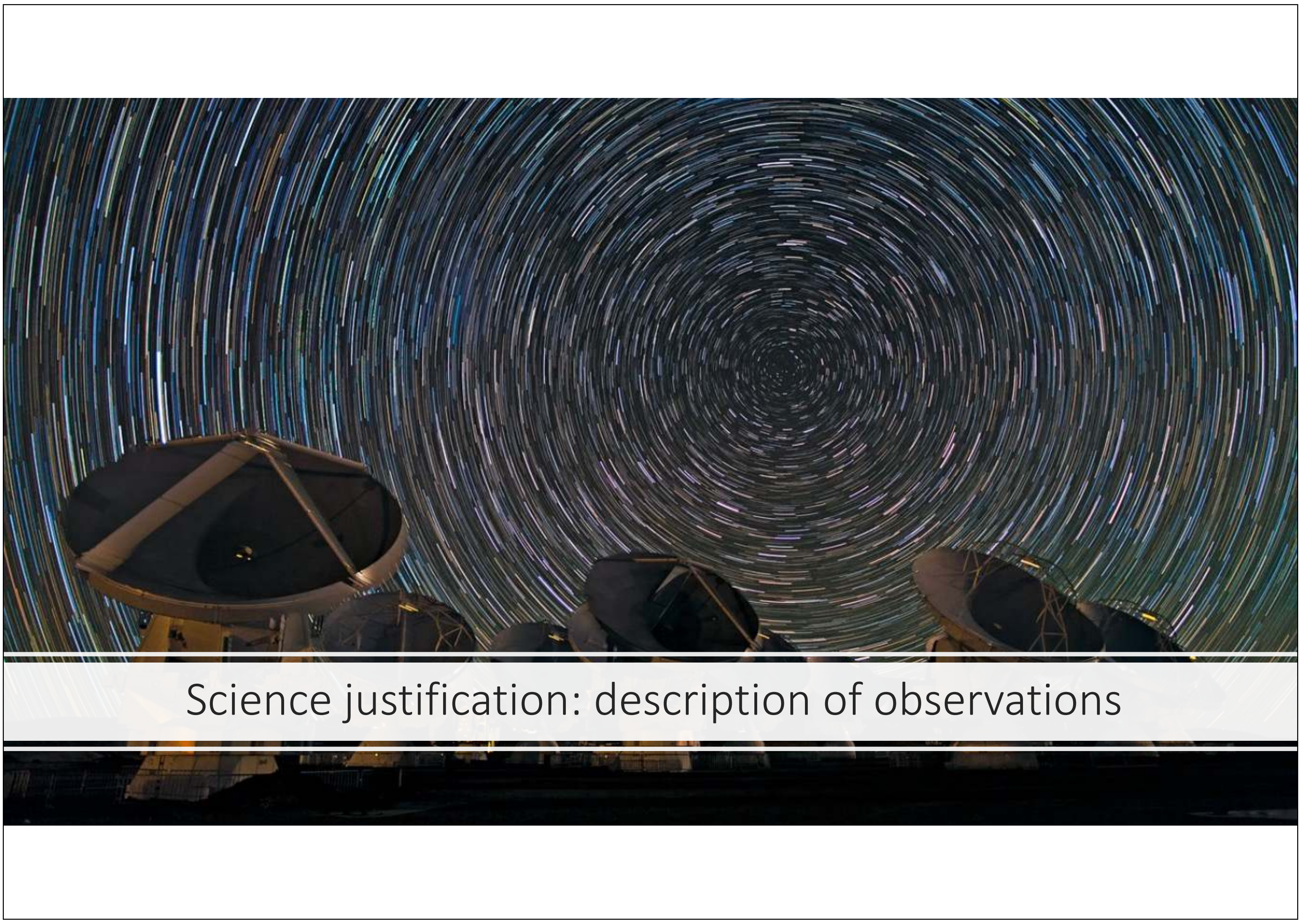
- they can better convey the message than dense text
- reviewers will look at the figures (and abstract) to refresh their memory a proposal, so figures/captions should convey the story of the proposal.

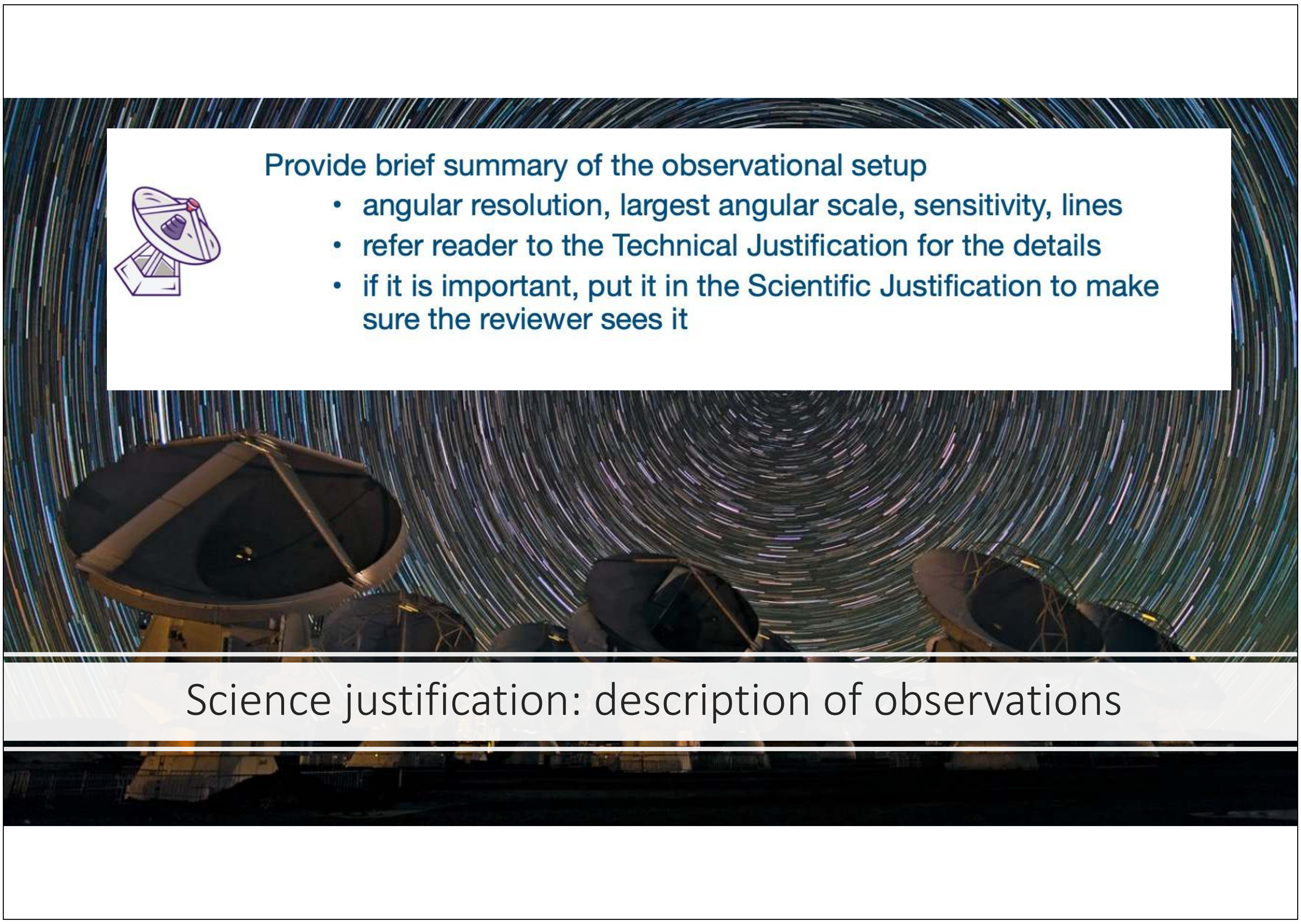
Tell the reviewer what is the point of the figure in the caption.

- do not assume the reviewer will determine it on their own

Figures and captions should be easily readable

- avoid small fonts and dense spacing


Science justification: description of observations


Provide brief summary of the observational setup
• angular resolution, largest angular scale, sensitivity, lines
• refer reader to the Technical Justification for the details
• if it is important, put it in the Scientific Justification to make sure the reviewer sees it
Science justification: description of observations

Scientific justification: references

Reference recent literature

- it conveys you are up-to-date on the latest results

Acknowledge other authors work

- while it is not possible to reference everyone, reviewers may get annoyed if you only reference your own work

Reviewers will not consult the references. If it is important, explain it in the Scientific Justification.

Proposal components

Technical Justification

ALMA Observing Tool

OT performs (most) technical validations
=> your proposal is technically doable in terms of sensitivity, resolution, etc…

Sensitivity

Angular resolution

Correlator setup

Convince the reviewer that the technical set up…

- can achieve the scientific goals of the proposal
- is the best setup to achieve the science goals
- uses ALMA time in the most efficient way

Technical justification

Sensitivity

- explain in detail how you derived the necessary sensitivity
- if applicable, discuss mosaic strategy or strategy to optimize a survey
- OK to include references

Angular resolution and largest angular scale

- explain why you chose the requested angular resolution and largest angular scale (be quantitative)
- OK to include references

Correlator setup

- explain why you chose the observed band / lines
- need to justify Band 6 vs. Band 7 continuum, ^{12}CO 2-1 vs. ^{12}CO 1-0, etc...
- if observing extra lines for “free” to maximize archival value/serendipity, then say so.

Repeat critical information from the Technical Justification in the Scientific Justification.
For example, the observed lines, continuum band, angular resolution, etc…

Technical justification: things to consider

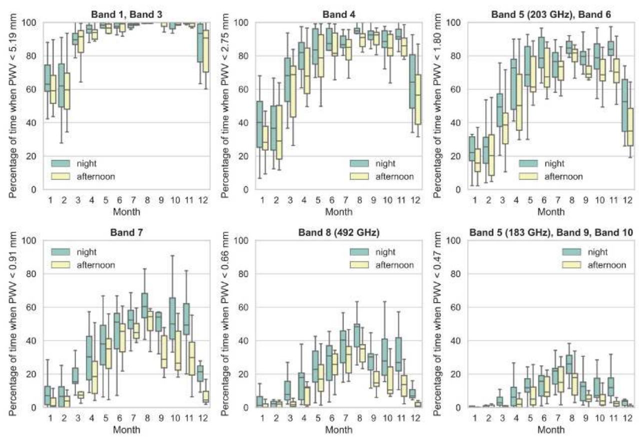
High frequencies and high resolution are challenging during afternoon/early-evening and Chilean summer.

Examine time of year and time of day your source would be observed given the configuration schedule and weather (see next slide).

- consider if a different combination of configuration / band would be more favorable
- mention this in the Technical Justification; it shows you are careful

Weather and configuration schedule

PWV vs. month of the year



Figures 2 and 3 in Proposer's Guide

Configuration schedule

Start date	Configuration	Longest baseline	LST for best observing conditions
2024 October 1	C-3	0.50 km	~ 22—10 h
2024 October 20	C-2	0.31 km	~ 23—11 h
2024 November 10	C-1	0.16 km	~ 1—13 h
2024 November 30	C-2	0.31 km	~ 2—14 h
2024 December 20	C-3	0.50 km	~ 4—15 h
2025 January 10	C-4	0.78 km	~ 5—17 h
2025 February 1	*No observations due to maintenance*		
2025 March 1	C-4	0.78 km	~ 8—21 h
2025 March 20	C-5	1.4 km	~ 9—23 h
2025 April 20	C-6	2.5 km	~ 11—1 h
2025 May 20	C-7	3.6 km	~ 13—3 h
2025 June 20	C-8	8.5 km	~ 14—5 h
2025 July 11	C-9	13.9 km	~ 16—6 h
2025 July 30	C-10	16.2 km	~ 17—7 h
2025 August 20	C-9	13.9 km	~ 19—8 h
2025 September 10	C-8	8.5 km	~ 20—9 h

Table 4 in Proposer's Guide

Configuration properties

Table A-1: Angular Resolutions (AR) and Maximum Recoverable Scales (MRS) for the Cycle 11 configurations

		Band	1	3	4	5	6	7	8	9	10
Config.	L_{max}	**Freq. (GHz)**	**40**	**100**	**150**	**185**	**230**	**345**	**460**	**650**	**870**
	L_{min}										
7-m	**45 m**	θ_{res} (arcsec)	31.5	12.5	8.35	6.77	5.45	3.63	2.72	1.93	1.44
	9 m	θ_{MRS} (arcsec)	167	66.7	44.5	36.1	29.0	19.3	14.5	10.3	7.67
C-1	**161 m**	θ_{res} (arcsec)	8.45	3.38	2.25	1.83	1.47	0.98	0.74	0.52	0.39
	15 m	θ_{MRS} (arcsec)	71.2	28.5	19.0	15.4	12.4	8.25	6.19	4.38	3.27
C-10	**16.2 km**	θ_{res} (arcsec)	0.11	0.042	0.028	0.023	0.018	0.012	0.0091	0.0065	0.0048
	244 m	θ_{MRS} (arcsec)	1.25	0.50	0.33	0.27	0.22	0.14	0.11	0.077	0.057

Maximum recoverable scale & Angular resolution

Configuration

Min/max antenna separations

The technical justification is important

A good technical justification will not win you ALMA time - only the Scientific Justification will.

However, a poor technical justification will cause reviewers to downgrade your proposal.

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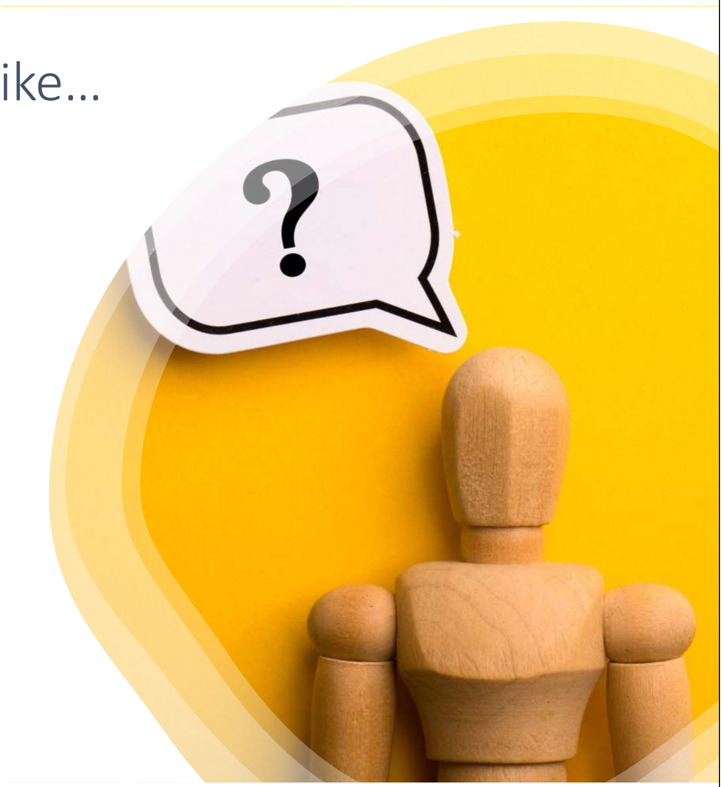
The technical justification is important

Contact your ARC Node for help!!!

Reviewers do not like…



Reviewers do not like…

Inconsistencies between cover sheet, scientific justification, & technical justification

- e.g., requested time / number of sources / configurations

Vast majority of time in your project is dominated by one (or few) source(s)
=> justify why that source is crucial or remove it

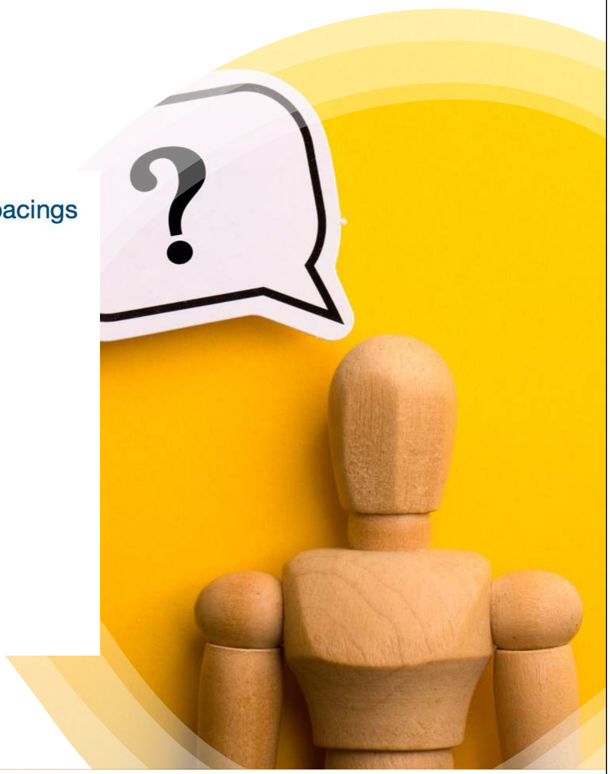
Reviewers do not like…

Vague generalities
- "increase our understanding"
- "help to constrain models"

=> be specific!

Over the top claims
- Rosetta Stone
- Holy Grail

Reviewers do not like…



Tiny fonts / small margins / tight line spacings
=> angers your reviewer!

Overuse of **bold**/*italics*/underline
=> If you use it, use it sparingly.

Spelling mistakes, grammatical errors
=> proofread your proposal … again

And a final reminder…
proposals must be written anonymously

Proposal should not reveal the proposing team

Reviewers should focus on the proposed science, and not on the proposing team

Guidelines provided on the ALMA Science Portal (Proposing => ALMA Proposal Review).

- Do not list the PI, co-PIs, or co-Is anywhere in the proposal
- Including Abstract, Scientific Justification, and Technical Justification

Use the third person

- Reference your own work in the third person

~~In Smith et al. (2018), we demonstrated …~~

~~Our study (Hayashi et al. 2021) showed that …~~

As demonstrated in Smith et al. (2018), …

Hayashi et al. (2021) showed that …

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As demonstrated in Smith et al. (2018), …

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- Do not name the PI when listing a project code, even if it is not your own project

~~Figure 1 shows the image from the Cycle 7 program (2091.1.02045.S, PI Pérez).~~

Figure 1 shows the image from the Cycle 7 program (2019.1.02045.S)

Questions? Comments?

Slides - ALMA/JWST Joint proposal

CHALMERS
UNIVERSITY OF TECHNOLOGY

Joint proposals with ALMA (& JWST)

Sabine König

EUROPEAN ARC
ALMA Regional Centre || Nordic

What is a Joint Proposal (JP)?

- requests time at ≥2 observatories, but submitted to single observatory for scientific peer review
- aim: facilitate programs requiring observations from multiple facilities to achieve scientific goals
- allows for single observatory to award observing time on multiple facilities
- PIs submit proposal to observatory with the largest time request
- same JP cannot be submitted to multiple observatories (duplications may be rejected)
- need for usage of all facilities must clearly be described in JP science case

Joint Proposal considerations

- JP must follow users‘ policies & CfP guidelines of all requested facilities + extra limitations & rules imposed on JP by each observatory (might differ depending on if facility = main/partner observatory)
  - JP submitted to ALMA → will follow ALMA‘s distributed peer review process
  - JP submitted to observatory partnered with ALMA: follow scientific review process of partner observatory
- all JPs technically assessed by all requested observatories based on information provided by PI (each observatory: own technical criteria for acceptance)
- if technically infeasible @ 1 observatory → JP rejected in entirety (no observations at other facilities)

Joint Proposal considerations

- justification of any special scheduling requirements (e.g., timing, source position on sky)
- time constrained observations (e.g., ToO)
  - allowed, should take scheduling limitations & observatory response time into account
  - need to clearly state requirements regarding simultaneous & coordinated observations (e.g., max. time delay between trigger and observations) → feasibility evaluated by all observatories
  - PI responsible for triggering observations at each observatory (procedures different for each observatory)
- after JP acceptance → PIs contacted to proceed with project preparations at partner observatories

ALMA JPs

- ALMA Joint Proposals since Cycle 10 (2023)
- users can request time on any or all partner observatories, or on JWST, VLA or VLT with ALMA as partner observatory
- ALMA partner observatories:
  - James Webb Space Telescope (JWST)
  - Very Large Array (VLA)
  - Very Large Telescope (VLT)

Partner	Maximum time ALMA can allocate on partner observatory	Maximum time partner observatory can allocate on each ALMA array
JWST	115 hours	115 hours
VLA	5% of available time	50 hours
VLT	50 hours	50 hours

From the ALMA Cycle 11 Proposers' Guide

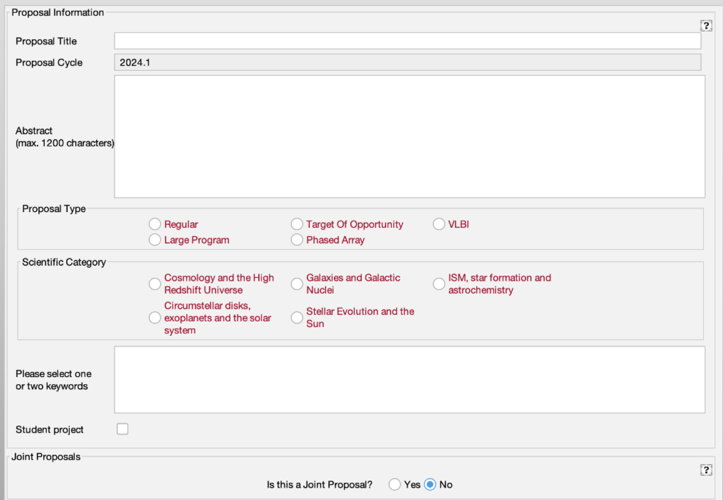
ALMA JP capabilities

- ALMA = main → same capabilities available as for ALMA only proposals
- ALMA = partner → cannot request VLBI or phased array observations
- ALMA = partner → time @ ALMA < time (ALMA LP, i.e. 50hrs)!
- ALMA DDTs cannot be Joint Proposals!
- accepted JP → grade „A" @ ALMA (high priority, will remain in queue for up to 2 years)
- after acceptance → ALMA JP non-scientific assessment: technical feasibility + scheduling feasibility + any specified time constraints

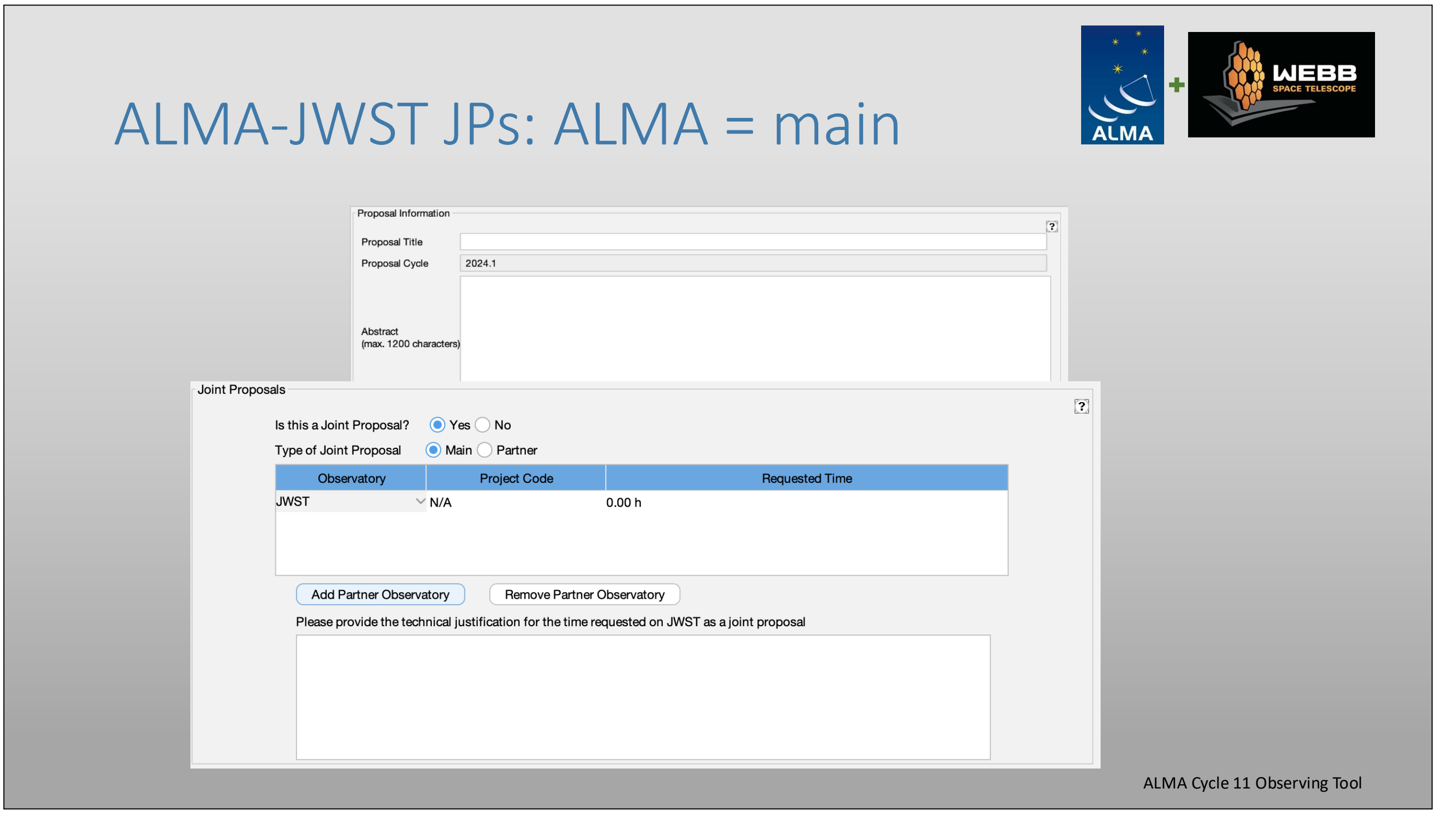
JWST JP capabilities

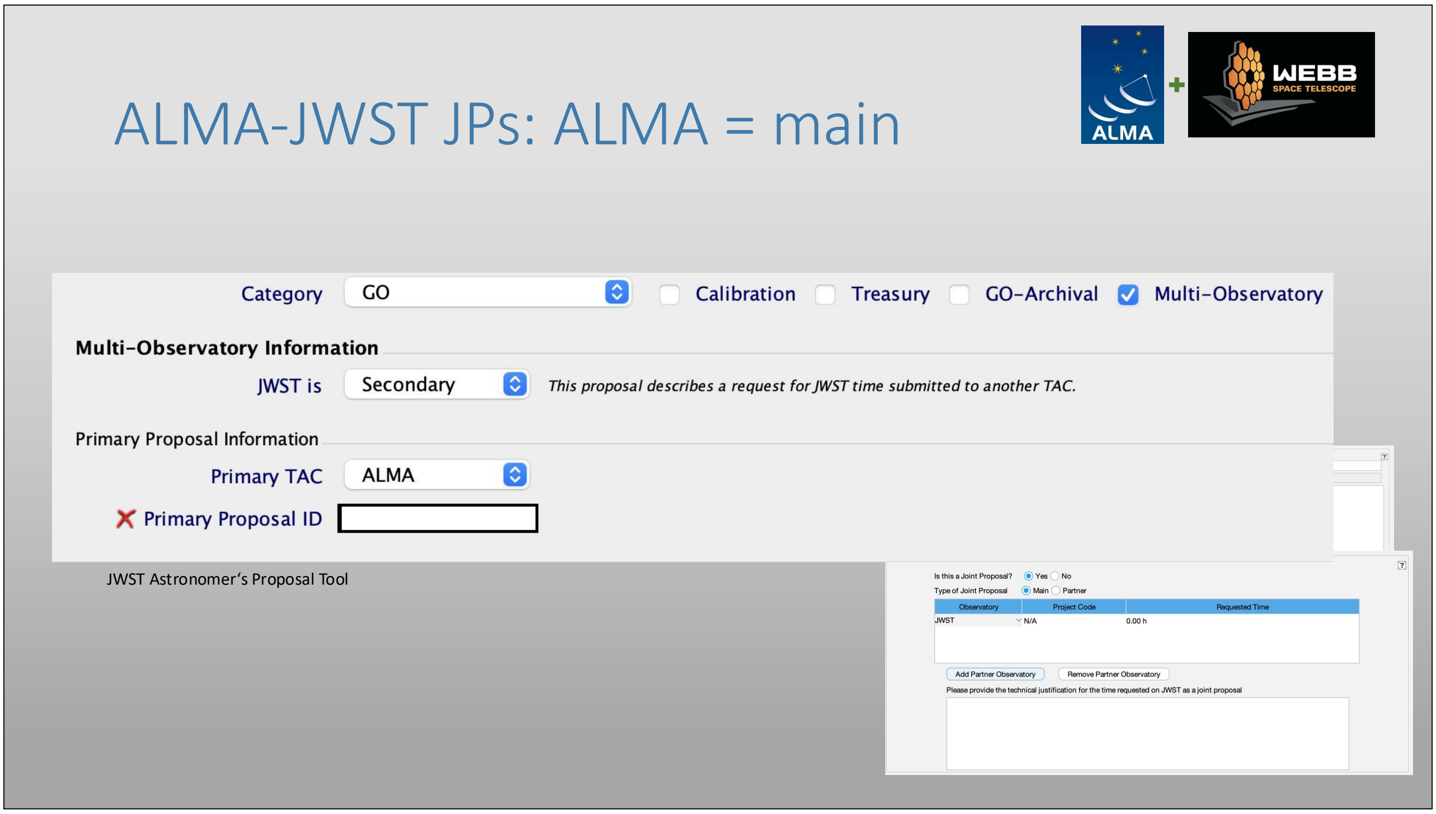
- JP requesting JWST time → standard JWST observing modes available
- JWST reserves right to reject JP approved by other observatory if technically infeasible, impossible to schedule, dangerous to JWST instruments, and/or requires resources beyond initially approved ones

ALMA-JWST JPs: ALMA = main


Proposal Information
Proposal Title
Proposal Cycle 2024.1
Abstract (max. 1200 characters)
Proposal Type
Regular
Target Of Opportunity
VLBI
Large Program
Phased Array
Scientific Category
Cosmology and the High Redshift Universe
Galaxies and Galactic Nuclei
ISM, star formation and astrochemistry
Circumstellar disks, exoplanets and the solar system
Stellar Evolution and the Sun
Please select one or two keywords
Student project
Joint Proposals
Is this a Joint Proposal? Yes No

ALMA Cycle 11 Observing Tool

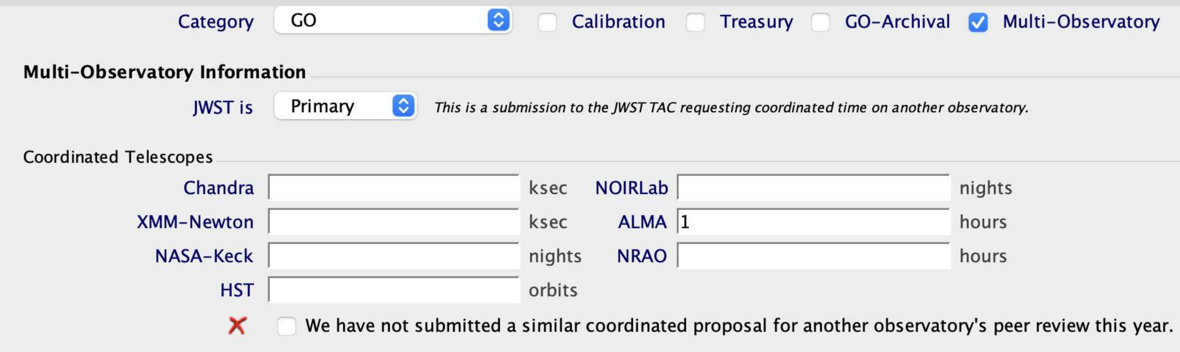

ALMA-JWST JPs: ALMA = main
ALMA
WEBB SPACE TELESCOPE
Proposal Information
Proposal Title
Proposal Cycle
2024.1
Abstract (max. 1200 characters)
Joint Proposals
Is this a Joint Proposal? Yes No
Type of Joint Proposal Main Partner
Observatory
Project Code
Requested Time
JWST
N/A
0.00 h
Add Partner Observatory
Remove Partner Observatory
Please provide the technical justification for the time requested on JWST as a joint proposal
ALMA Cycle 11 Observing Tool


ALMA-JWST JPs: ALMA = main
ALMA
WEBB SPACE TELESCOPE
Category GO Calibration Treasury GO-Archival Multi-Observatory
Multi-Observatory Information
JWST is Secondary
This proposal describes a request for JWST time submitted to another TAC.
Primary Proposal Information
Primary TAC ALMA
Primary Proposal ID
JWST Astronomer's Proposal Tool

ALMA-JWST JPs: ALMA = main

- t_{obs}(JWST), including overheads, must come from JWST APT (Astronomer‘s Proposal Tool)
- quantitative estimates of time/rms accuracy required (use JWST ETC)
- justification for JWST instrument selection (e.g., instruments, modes, filters, etc.) must be included in ALMA science case
- justification of JWST coordinated parallel observations (observations with 2 modes at same time)
- once JP accepted → request by JWST to provide additional information:
  - JWST APT file (specifications of requested observations)
  - „Extended JWST Scientific and Technical Justification for Joint Programs“

ALMA-JWST JPs: JWST = main


Category GO ☐ Calibration ☐ Treasury ☐ GO-Archival ☑ Multi-Observatory

Multi-Observatory Information

JWST is Primary *This is a submission to the JWST TAC requesting coordinated time on another observatory.*

Coordinated Telescopes

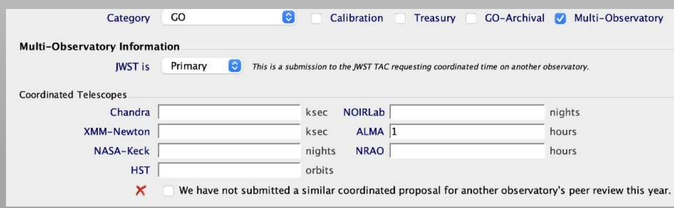
Chandra		ksec	NOIRLab		nights
XMM-Newton		ksec	ALMA	1	hours
NASA-Keck		nights	NRAO		hours
HST		orbits			

✗ ☐ We have not submitted a similar coordinated proposal for another observatory's peer review this year.

JWST Astronomer‘s Proposal Tool

ALMA-JWST JPs: JWST = main

ALMA Cycle 11 Observing Tool



ALMA-JWST JPs: JWST = main

- t_{obs}(ALMA), including overheads, must come from the OT → t_{obs}(ALMA) = sum of all 12m array configurations + ACA (stand-alone) + (ACA+TP)
- ALMA technical information must be marked in two places @ JWST:
  - (1) in "Coordinated Telescopes" section of APT (incl. ALMA hour request)
  - (2) in „Coordinated Observations“ section of PDF file to be uploaded to APT
- find detailed list of ALMA requirements to include in JWST JP here:
  https://jwst-docs.stsci.edu/jwst-opportunities-and-policies/jwst-call-for-proposals-for-cycle-4/jwst-preparation-of-the-pdf-attachment#JWSTPreparationofthePDFAttachment-JointJWST-ALMAObservations
- if JP accepted → PIs required to submit programs to ALMA using OT → preparation of Scheduling Blocks & performance of final detailed technical assessment

Documentation

- ALMA Cycle 11 documents:
  https://almascience.eso.org/documents-and-tools
- ALMA Cycle 11 Proposer's Guide:
  https://almascience.eso.org/documents-and-tools/cycle11/alma-proposers-guide
- ALMA Cycle 11 User's Policies:
  https://almascience.eso.org/documents-and-tools/cycle11/alma-user-policies
- ALMA Cycle 11 Principles of the ALMA Proposal Review Process:
  https://almascience.eso.org/documents-and-tools/cycle9/principles-review-process
- ALMA Observing Tool:
  https://almascience.eso.org/documents-and-tools/cycle11/alma-ot-usermanual
- JWST Astronomer's Tool:
  https://jwst-docs.stsci.edu/jwst-astronomers-proposal-tool-overview - gsc.tab=0
- JWST Exposure Time Calculator:
  https://jwst-docs.stsci.edu/jwst-exposure-time-calculator-overview#gsc.tab=0
- JWST PDF Preparation:
  https://jwst-docs.stsci.edu/jwst-opportunities-and-policies/jwst-call-for-proposals-for-cycle-4/jwst-preparation-of-the-pdf-attachment - JWSTPreparationofthePDFAttachment-JointJWST-ALMAObservations

About the accepted proposal

When a proposal is approved by both observatories, the full JWST proposal, including the PDF file and all technical details, is available online. On the ALMA side, however, only the abstract is accessible at this time. Joint proposals must go through independent review processes for both ALMA and JWST, with each observatory assessing the scientific and technical feasibility of the proposal within its domain.

Below, we categorize proposals into two groups: those accepted by both observatories (JWST/ALMA) and those approved only by JWST. Each category is color-coded for clarity: joint proposals (JWST/ALMA) are marked in orange and JWST-only proposals are in purple. For each proposal, we provide the JWST ID (if applicable), the ALMA ID (if applicable), and the project title. Where available, the abstract from the ALMA side and the full PDF file from the JWST side can be consulted for further details.

When available, detailed information about the proposals can be found in the following chapters:

- For joint JWST/ALMA proposals, combining abstracts from ALMA and PDFs from JWST.
- For JWST-only proposals, with PDF files containing the full proposal details.

PI Name (Category)	JWST ID	ALMA ID	Project Title
Hynes, Robert	3384	2023.1.01719.S	What is the Origin of the Mysterious Infrared Excess in Quiescent Black Hole Binaries?
Zhang, Yichen	3907	2023.1.01721.S	Unveiling the Early Stages of Massive Binary Formation with JWST
Fujimoto, Seiji	4573	2023.1.00149.S	IFU Trio of ALMA, MUSE, JWST: Revealing Dynamical Interplay of Inflow/Outflow at z=6 with Strong Lensing Aid
Cugno, Gabriele	6739	2024.1.00780.S	GQ Lup unveiled: Probing the Evolution of a Circumplanetary Disk
Killi, Meghana	6743	2024.1.01091.S	Understanding Little Red Dots with ALMA and MIRI
Greene, Jenny	6761	2024.1.00826.S	Of Dust and Dots: ALMA's View of the Brightest of JWST's Little Red Dots
Roberta, Tripodi	4574	-	Dissecting the kinematics of the central region z=6 QSO with ALMA and JWST
Ryan, Boyden	6130	-	The most typical planet formation in the most typical environments
David, Setton	6719	-	Mapping Cold Gas and Star Formation in Gas Rich Post-Starburst Galaxies Near Cosmic Noon
Hideki, Umehata	6751	-	Resolving the early phase of co-evolution of galaxies and supermassive black holes within cosmic web filaments

JWST-ALMA joint proposals (JWST and ALMA))

What is the Origin of the Mysterious Infrared Excess in Quiescent Black Hole Binaries? (JWST/ALMA)

Hynes, Robert
ALMA ID: 2023.1.01719.S
JWST ID: 3384

ALMA proposal abstract: We will observe the quiescent black hole binary, V404 Cyg, with JWST and ALMA. This is a prototype of the class of ’electromagnetic black holes’ with normal stellar companions, in contrast to binary stellar mass black holes identified by LIGO. V404 Cyg exhibits an IR excess in Spitzer observations above that expected from either the secondary star or the accretion disk. Two explanations are proposed. Either it originates from synchrotron emission from a relativistic jet that persists into quiescence or from a large, cool circumbinary disk. We will discriminate between these possibilities by using the large throughput and sensitivity of JWST coupled with simultaneous ALMA observations of the radio jet to search for mid-IR variability and multiwavelength correlation and measure the mid-IR-mm spectral energy distribution. No short timescale variability is expected from a circumbinary disk so variability, especially if correlated with ALMA, would falsify the disk model and confirm mid-IR jet emission. [... See original JWST proposal for last 3 sentences in Abstract]

3384 - Testing the Jet Origin of the Mysterious Infrared Excess in Quiescent Black Hole Binaries

Cycle: 2, Proposal Category: GO

INVESTIGATORS

Name	***Institution***
Prof. Robert I. Hynes (PI)	**Louisiana State University and A & M College**
Alexander B Igl (CoI)	Louisiana State University and A & M College
Prof. Poshak Gandhi (CoI) (ESA Member)	University of Southampton
Prof. Thomas J. Maccarone (CoI)	Texas Tech University
Dr. Alexandra Jean Tetarenko (CoI) (CSA Member)	University of Lethbridge
Dr. Richard M. Plotkin (CoI)	University of Nevada - Reno
Dr. Gregory R. Sivakoff (CoI) (CSA Member)	University of Alberta
Dr. Aarran Shaw (CoI)	Butler University
Dr. James Miller-Jones (CoI)	Curtin University
Dr. Craig Heinke (CoI) (CSA Member)	University of Alberta
Prof. Philip A. Charles (CoI) (ESA Member)	University of Southampton
Eric Borowski (CoI)	Louisiana State University and A & M College

OBSERVATIONS

Folder	***Observation***	***Label***	***Observing Template***	***Science Target***
V404 Observations				
	1		MIRI Imaging	(1) V404-CYG
	2		MIRI Imaging	(1) V404-CYG
	3		MIRI Imaging	(1) V404-CYG

ABSTRACT

We will observe the quiescent black hole X-ray binary V404 Cyg with JWST/MIRI and ALMA. This is a prototype of the class of 'electromagnetic black holes' with normal stellar companions, in contrast to binary stellar mass black holes identified by LIGO. V404 Cyg exhibits an IR excess in Spitzer observations above that expected from either the secondary star or the accretion disk. Two explanations are proposed. Either it originates from synchrotron emission from a relativistic jet that persists into quiescence or from a large, cool circumbinary disk. We will discriminate between these possibilities by using the large throughput and sensitivity of JWST coupled with simultaneous ALMA observations of the radio jet to search for mid-IR variability and multiwavelength correlation and measure the mid-IR-mm spectral energy distribution. No short timescale variability is expected from a circumbinary disk so variability, especially if correlated with ALMA, would falsify the disk model and confirm mid-IR jet emission. On the other hand, if ALMA sees variability but JWST does not, this will support the circumbinary disk interpretation with profound implications for compact binary evolution. Joint JWST-ALMA observations of the jet would probe jet formation close to the black hole at extremely low accretion rates, and would be compared to predicted multiwavelength lightcurves from models of internal shocks in jets. These observations when compared to observations from V404 Cyg in outburst would allow a study of jets spanning five orders of magnitude dynamic range in luminosity.

OBSERVING DESCRIPTION

We will perform time-series observations with JWST supported by ALMA of the quiescent black hole binary V404 Cyg to search for infrared and mm variability expected from a jet together with multicolor photometry to measure its mid-IR spectral energy distribution. Based on radio observations we expect flares on timescales of minutes, but also anticipate shorter timescale variability will be present at shorter wavelengths.

We will use MIRI imaging in Time Series Observation mode to obtain two uninterrupted series of images over two hours each (matched to ALMA two hour observing blocks). Sub-array (SUB64) mode will be used as these are single point-sources and we wish to maximize time-resolution. We use 64 groups per integration to permit well-calibrated 5.45 second resolution lightcurves, and will also examine individual groups to search for higher time-resolution information.

V404 Cyg has a luminous sub-giant companion, so we work primarily in the mid-IR using the F2100W filter with which we expect a large contrast with a jet or circumbinary disk. We include a sequence of observations spanning the F1280W to F2550W filters to measure the shape of the spectral energy distribution. We anticipate that these can be scheduled at the end of the second time-series rather than as a self-contained observation.

Joint ALMA observations should be scheduled simultaneously, with one two hour block matched to each of Observations 1 and 2. V404 Cyg is a northern target so it is likely that ALMA will require scheduling these on different nights, but we would prefer to observe them back to back if ALMA can match that and that would save on slew time.

Proposal 3384 - Targets - Testing the Jet Origin of the Mysterious Infrared Excess in Quiescent Black Hole Binaries

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	V404-CYG	RA: 20 24 3.8181 (306.0159087d) Dec: +33 52 1.84 (33.86718d) Equinox: J2000	Proper Motion RA: -5.177 mas/yr Proper Motion Dec: -7.778 mas/yr Parallax: 0.0003024" Epoch of Position: 2016.0	

Comments: Coordinates are taken from Gaia DR3
Category=Star
Description=[Black holes, Compact binary systems, Low-mass X-ray binary stars, X-ray binary stars, X-ray transients]
Extended=NO

Proposal 3384 - Observation 1 - Testing the Jet Origin of the Mysterious Infrared Excess in Quiescent Black Hole Binaries

Observation

Proposal 3384, Observation 1 Wed Sep 13 21:01:21 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Comments: The BETWEEN requirement results from communicaiton between Tony Roman, JWST LRP staff, the PI, ALMA science operations staff, and Chandra science operations staff to determine when ALMA, Chandra, and JWST may observe simultaneously.

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	V404-CYG	RA: 20 24 3.8181 (306.0159087d) Dec: +33 52 1.84 (33.86718d) Equinox: J2000	Proper Motion RA: -5.177 mas/yr Proper Motion Dec: -7.778 mas/yr Parallax: 0.0003024" Epoch of Position: 2016.0	

Comments: Coordinates are taken from Gaia DR3
Category=Star
Description=[Black holes, Compact binary systems, Low-mass X-ray binary stars, X-ray binary stars, X-ray transients]
Extended=NO

Template

Subarray
SUB256

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F2100W	FASTR1	20	1185	1	None	1	1185	7453.256	147290.7

Special Requirements

Between Dates 14-OCT-2023:19:30:00 and 14-OCT-2023:20:30:00
Time Series Observation
No Parallel Attachments
No Parallel Attachments

Sequence Observations 1, 2, 3, Non-interruptible

Observation

Proposal 3384, Observation 2

Wed Sep 13 21:01:21 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Comments: This observation is to be simultaneous with our second two hour ALMA observation. Since V404 Cyg is in the northern hemisphere, ALMA nightly visibility is limited and it may not be possible to accomodate all four hours of requested ALMA time in a single night. We have therefore inserted the AFTER 1 DAY special requirement so that the slew time for the second observation is properly accounted for. This requirement can be removed if ALMA are able to schedule our observations within a single night.

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	V404-CYG	RA: 20 24 3.8181 (306.0159087d) Dec: +33 52 1.84 (33.86718d) Equinox: J2000	Proper Motion RA: -5.177 mas/yr Proper Motion Dec: -7.778 mas/yr Parallax: 0.0003024" Epoch of Position: 2016.0	

Comments: Coordinates are taken from Gaia DR3
Category=Star
Description=[Black holes, Compact binary systems, Low-mass X-ray binary stars, X-ray binary stars, X-ray transients]
Extended=NO

Template

Subarray
SUB256

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F2100W	FASTR1	20	1185	1	None	1	1185	7453.256	55898.1

Special Requirements

Time Series Observation
No Parallel Attachments

Sequence Observations 1, 2, 3, Non-interruptible

Observation

Proposal 3384, Observation 3

Wed Sep 13 21:01:21 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Comments: This observation should be taken immediately after Observation 2 to minimize the impact of long-term variability on our ALMA-JWST SED and our comparison of spectral and timing characteristics. This also avoids superfluous slew-time.

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	V404-CYG	RA: 20 24 3.8181 (306.0159087d) Dec: +33 52 1.84 (33.86718d) Equinox: J2000	Proper Motion RA: -5.177 mas/yr Proper Motion Dec: -7.778 mas/yr Parallax: 0.0003024" Epoch of Position: 2016.0	

Comments: Coordinates are taken from Gaia DR3
Category=Star
Description=[Black holes, Compact binary systems, Low-mass X-ray binary stars, X-ray binary stars, X-ray transients]
Extended=NO

Template

Subarray
SUB256

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	POINT SOURCE	POSITIVE	DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1280W	FASTR1	5	1	1	Dither 1	4	4	5.99	147290.8
2	F1500W	FASTR1	5	1	1	Dither 1	4	4	5.99	147290.9
3	F1800W	FASTR1	7	1	1	Dither 1	4	4	8.387	147290.10
4	F2100W	FASTR1	11	1	1	Dither 1	4	4	13.179	147290.11
5	F2550W	FASTR1	100	3	1	Dither 1	4	12	361.82	147290.12

Special Requirements

Sequence Observations 1, 2, 3, Non-interruptible

Unveiling the Early Stages of Massive Binary Formation with JWST (JWST/ALMA)

Zhang, Yichen
2023.1.01721.S
JWST ID: 3907

ALMA proposal abstract: Most of massive stars are born in binary systems, therefore understanding massive binary formation is crucial for understanding massive star formation in general. Observational studies of massive forming binaries in the embedded phase are still very limited. JWST provides a new, unique window to study such systems. We propose JWST/NIRCam observations of two forming massive binaries, which are the closest-separation embedded-phase massive forming binaries identified to date. We aim to: 1) directly image the massive binaries utilizing the high resolution and sensitivity of JWST, and characterize the stellar properties and accretion status of individual members in these systems; 2) map the extended emissions of the outflow cavities, to determine the cavity geometries and heated dust distributions, especially in the innermost regions. 3) probe the low-mass young stellar objects (YSOs) forming along with the massive binaries. To achive the last goal, we also propose joint ALMA observation in 0.85 mm, to significantly improve the detection sensitivities of cold dust structures of the YSOs to achieve of a complete census of the low-mass YSO populations around these massive binaries.

3907 - Unveiling the Early Stages of Massive Binary Formation with JWST

Cycle: 2, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Yichen Zhang (PI)	**Shanghai Jiao Tong University**
Dr. Ruben Fedriani (CoI) (ESA Member)	Instituto de Astrofisica de Andalucia (IAA)
Prof. Jonathan Charles Tan (CoI) (ESA Member) (CoPI)	Chalmers University of Technology
Mr. Chi-Yan Law (CoI) (ESA Member)	Chalmers University of Technology
Dr. Morten Andersen (CoI) (ESA Member)	European Southern Observatory - Germany
Dr. Yao-Lun Yang (CoI)	RIKEN Wako Institute
Mr. Yu Cheng (CoI)	National Astronomical Observatory of Japan (NAOJ)
Dr. Joseph Armstrong (CoI) (ESA Member)	Chalmers University of Technology
Dr. Jon Ramsey (CoI)	The University of Virginia
Dr. Kei Tanaka (CoI)	Tokyo Institute of Technology - TIT
Dr. Jan Erling Staff (CoI)	University of the Virgin Islands
Dr. Matthew De Furio (CoI)	University of Texas at Austin
Prof. Zhi-Yun Li (CoI) (US Admin CoI)	The University of Virginia

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
NIRCam for SOMA sources				
	1	NIRCAM IRAS07299	NIRCam Imaging	(1) IRAS07299
	2	NIRCAM G339	NIRCam Imaging	(2) G339.88-1.26

ABSTRACT

Most of massive stars are born in binary systems, therefore understanding massive binary formation is crucial for understanding massive star formation in general. Observational studies of massive forming binaries in the embedded phase are still very limited. JWST provides a new, unique

window to study such systems. We propose JWST/NIRCam observations of two forming massive binaries, which are the closest-separation embedded-phase massive forming binaries identified to date. We aim to: 1) directly image the massive binaries utilizing the high resolution and sensitivity of JWST, and characterize the stellar properties and accretion status of individual members in these systems; 2) map the extended emissions of the outflow cavities, to determine the cavity geometries and heated dust distributions, especially in the innermost regions. 3) probe the low-mass young stellar objects (YSOs) forming along with the massive binaries, placing massive binary formation into the context of star cluster formation. To achive the last goal, we also propose joint ALMA observation in 0.85 mm, to significantly improve the detection sensitivities of cold dust structures of the YSOs to achieve of a complete census of the low-mass YSO populations around these massive binaries. These observations will generate important constraints on theories of massive star formation, binary formation, and star cluster formation.

OBSERVING DESCRIPTION

This programme will observe high mass star forming regions with NIRCam to characterise massive protostars, the protocluster environment, and the stellar content down to the substellar regime. It will use a single pointing with a 6 dither pattern and observe in three SW plus LW filters pairs (F162M+F150W2 plus F405N+F444W, F182M plus F470N+F444W, F200W plus F356W). These filters will reveal the stellar population, spatial distribution, and outflow activity in the regions.
No extra special calibrations are needed.

Proposal 3907 - Targets - Unveiling the Early Stages of Massive Binary Formation with JWST

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	IRAS07299	RA: 07 32 9.7860 (113.0407750d) Dec: -16 58 12.15 (-16.97004d) Equinox: J2000		
Comments: Category=Star Description=[Ejecta, Young stellar objects] Extended=YES				
(2)	G339.88-1.26	RA: 16 52 4.6630 (253.0194292d) Dec: -46 08 33.88 (-46.14274d) Equinox: J2000		
Comments: Category=Star Description=[Ejecta, Young stellar objects] Extended=YES				

Observation

Proposal 3907, Observation 1: NIRCAM IRAS07299 Tue Oct 31 18:00:13 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Coordinated Parallel Template(s): NIRISS Imaging

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	IRAS07299	RA: 07 32 9.7860 (113.0407750d) Dec: -16 58 12.15 (-16.97004d) Equinox: J2000		

Comments:
Category=Star
Description=[Ejecta, Young stellar objects]
Extended=YES

Template

NIRCam Imaging	NIRISS Imaging
Module: ALL Subarray: FULL Target Placement: B Short (on B4)	

Dithers

#	Primary Dither Type	Primary Dithers	Dither Size	Subpixel Positions	Coordinated Parallel Subpixel Selector	Dither Direct Images Primes
1	FULLBOX	6TIGHT		1	NIRCam Only	NO_DITHERING

Spectral Elements

NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F162M+F150W2	F405N+F444W	SHALLOW2	6	1	6	6	1739.357	
2	F212N	F470N+F444W	SHALLOW2	6	1	6	6	1739.357	
3	F182M	F480M	SHALLOW2	6	1	6	6	1739.357	
4	F115W	F360M	SHALLOW2	3	1	6	6	773.047	

Spectral Elements

NIRISS Imaging	Filter	Grism	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F158M		NIS	6	1	6	6	1610.516	
2	F356W		NIS	6	1	6	6	1610.516	
3	F480M		NIS	6	1	6	6	1610.516	
4	F200W		NIS	2	1	6	6	579.786	

Proposal 3907 - Observation 1 - Unveiling the Early Stages of Massive Binary Formation with JWST

Special Requirements	
	Aperture PA Range 24.05583529 to 114.05583529 Degrees (V3 24.0 to 114.0) Aperture PA Range 122.05583529 to 138.05583529 Degrees (V3 122.0 to 138.0) Aperture PA Range 145.05583529 to 155.05583529 Degrees (V3 145.0 to 155.0) Aperture PA Range 165.05583529 to 192.05583529 Degrees (V3 165.0 to 192.0) Aperture PA Range 199.05583529 to 202.05583529 Degrees (V3 199.0 to 202.0) Aperture PA Range 213.05583529 to 214.05583529 Degrees (V3 213.0 to 214.0) Aperture PA Range 226.05583529 to 234.05583529 Degrees (V3 226.0 to 234.0) Aperture PA Range 240.05583529 to 257.05583529 Degrees (V3 240.0 to 257.0) Aperture PA Range 262.05583529 to 282.05583529 Degrees (V3 262.0 to 282.0) Aperture PA Range 293.05583529 to 299.05583529 Degrees (V3 293.0 to 299.0) Aperture PA Range 309.05583529 to 18.05583529 Degrees (V3 309.0 to 18.0) No Parallel Attachments Fiducial Point Override NRCBS_FULL

Observation

Proposal 3907, Observation 2: NIRCAM G339 Tue Oct 31 18:00:13 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Coordinated Parallel Template(s): NIRISS Imaging

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	G339.88-1.26	RA: 16 52 4.6630 (253.0194292d) Dec: -46 08 33.88 (-46.14274d) Equinox: J2000		

Comments:
Category=Star
Description=[Ejecta, Young stellar objects]
Extended=YES

Template

NIRCam Imaging	NIRISS Imaging
Module: ALL Subarray: FULL Target Placement: B Short (on B4)	

Dithers

#	Primary Dither Type	Primary Dithers	Dither Size	Subpixel Positions	Coordinated Parallel Subpixel Selector	Dither Direct Images Primes
1	FULLBOX	6TIGHT		1	NIRCam Only	NO_DITHERING

Spectral Elements

NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F162M+F150W2	F405N+F444W	SHALLOW2	6	1	6	6	1739.357	
2	F212N	F470N+F444W	SHALLOW2	6	1	6	6	1739.357	
3	F182M	F480M	SHALLOW2	6	1	6	6	1739.357	
4	F115W	F360M	SHALLOW2	3	1	6	6	773.047	

Spectral Elements

NIRISS Imaging	Filter	Grism	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F158M		NIS	6	1	6	6	1610.516	
2	F356W		NIS	6	1	6	6	1610.516	
3	F480M		NIS	6	1	6	6	1610.516	
4	F200W		NIS	2	1	6	6	579.786	

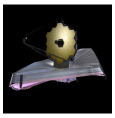
Proposal 3907 - Observation 2 - Unveiling the Early Stages of Massive Binary Formation with JWST

Special Requirements	Aperture PA Range 31.05583529 to 158.05583529 Degrees (V3 31.0 to 158.0) Aperture PA Range 172.05583529 to 173.05583529 Degrees (V3 172.0 to 173.0) Aperture PA Range 177.05583529 to 206.05583529 Degrees (V3 177.0 to 206.0) Aperture PA Range 216.05583529 to 21.05583529 Degrees (V3 216.0 to 21.0) No Parallel Attachments Fiducial Point Override NRCBS_FULL

IFU Trio of ALMA, MUSE, JWST: Revealing Dynamical Interplay of Inflow/Outflow at z=6 with Strong Lensing Aid (JWST/ALMA)

Fujimoto, Seiji
2023.1.00149.S
JWST ID: 4573

ALMA proposal abstract: We propose deep [CII] 158um line observations, targeting a strongly lensed galaxy at z=6 discovered in the 100-hr ALMA Lensing Cluster Survey. Among normal star-forming galaxies at zspec>6, it is the brightest lensed source known ([CII] flux=25mJy, H=23.5mag), but intrinsically a faint z=6.07 sub-Lstar galaxy (Mstar=10^9Msun) due to its high (mu=30-160) magnification. JWST/NIRSpec IFU data show unambiguous ionized gas outflows, while a deep MUSE follow-up reveals a significantly extended (6") Lya structure around the galaxy, redshifted by 400km/s. Intriguingly, the current ALMA data also display an extended (3") and redshifted (150km/s) [CII] structure potentially associated with Lya. The simple goal of this proposal is to improve the [CII] sensitivity by factors of >2-4 and conclusively map out its 3D distribution relative to Lya. We also request 2.6-hour of JWST F466N imaging to map the Ha distribution which fortunately falls in the NIRcam narrow-band response to understand whether the extended Lya can be ascribed to an inflow or outflow scenario.



4573 - IFU Trio of ALMA, MUSE, JWST: Revealing Dynamical Interplay of Inflow/Outflow at z=6 with Strong Lensing Aid

Cycle: 2, Proposal Category: GO

INVESTIGATORS

Name	***Institution***
Dr. Seiji Fujimoto (PI)	**University of Texas at Austin**
Dr. Gabriel Brammer (CoI) (ESA Member)	University of Copenhagen, Niels Bohr Institute
Prof. Kotaro Kohno (CoI)	University of Tokyo, Institute of Astronomy
Dr. Nicolas Laporte (CoI) (ESA Member)	CNRS, Laboratoire d'Astrophysique de Marseille
Prof. Masamune Oguri (CoI)	Chiba University
Dr. Miroslava Dessauges-Zavadsky (CoI) (ESA Member)	University of Geneva, Department of Astronomy
Prof. Masami Ouchi (CoI)	National Astronomical Observatory of Japan (NAOJ)
Dr. Yuki Yoshimura (CoI)	University of Tokyo, Institute of Astronomy
Dr. Jorge Ignacio Gonzalez Lopez (CoI)	Carnegie Institution of Washington
Dr. Franz Bauer (CoI)	Space Science Institute
Dr. Yoshiaki Ono (CoI)	University of Tokyo, Institute of Cosmic Ray Research
Prof. Kirsten Kraiberg Knudsen (CoI) (ESA Member)	Chalmers University of Technology
Prof. Kazuhiro Shimasaku (CoI)	University of Tokyo, Graduate School of Science
Dr. Hideki Umehata (CoI)	Nagoya University
Tim Rawle (CoI) (ESA Member)	ESA-European Space Astronomy Centre
Dr. Johan Pierre Richard (CoI) (ESA Member)	Centre de Recherche Astrophysique de Lyon
Prof. Adi Zitrin (CoI)	Ben Gurion University of the Negev
Dr. Eiichi Egami (CoI)	University of Arizona
Dr. Minju Lee (CoI) (ESA Member)	Cosmic Dawn Center, Niels Bohr Institute
Dr. Yoshinobu Fudamoto (CoI)	Chiba University
Dr. Yiping Ao (CoI)	Purple Mountain Observatory, CAS

Name	*Institution*
Dr. Anton M. Koekemoer (CoI)	Space Telescope Science Institute
Dr. Wei-Hao Wang (CoI)	Academia Sinica, Institute of Astronomy and Astrophysics
Dr. Bunyo Hatsukade (CoI)	National Astronomical Observatory of Japan (NAOJ)
Prof. Georgios Magdis (CoI) (ESA Member)	Technical University of Denmark-DTU Space
Dr. Francesco Maria Valentino (CoI) (ESA Member)	European Southern Observatory - Germany
Dr. Gabriel Bartosch Caminha (CoI) (ESA Member)	Technical University of Munich
Dr. David Hughes (CoI)	Instituto Nacional de Astrofisica, Optica y Elecronica
Dr. Fengwu Sun (CoI)	Harvard University
Dr. Tao Wang (CoI)	University of Tokyo, Institute of Astronomy
Dr. Wiphu Rujopakarn (CoI)	Chulalongkorn University
Prof. Rob J. Ivison (CoI) (ESA Member)	European Southern Observatory - Germany
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Prof. Sune Toft (CoI) (ESA Member)	University of Copenhagen, Niels Bohr Institute
Prof. Karina Caputi (CoI) (ESA Member)	Kapteyn Astronomical Institute
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Dr. Vasily Kokorev (CoI)	University of Texas at Austin
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Dr. Larry Bradley (CoI)	Space Telescope Science Institute
Prof. Min S. Yun (CoI)	University of Massachusetts - Amherst
Dr. Haruka Kusakabe (CoI)	National Astronomical Obs of Japan (NAOJ), Subaru Telescope
Dr. Claudia del Pilar Lagos (CoI)	University of Western Australia
Prof. Daisuke Iono (CoI)	National Astronomical Observatory of Japan (NAOJ)
Prof. Daniel Espada (CoI) (ESA Member)	Universidad de Granada
Prof. Steven L. Finkelstein (CoI)	University of Texas at Austin

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	NIRCam Imaging	NIRCam Imaging	(1) NIRCAM-CENTER

ABSTRACT
We propose deep [CII] 158um line observations, targeting a strongly lensed galaxy at z=6 discovered in the 100-hr ALMA Lensing Cluster Survey. Among normal star-forming galaxies at zspec>6, it is the brightest lensed source known ([CII] flux=25mJy, H=23.5mag), but intrinsically a faint z=6.07 sub-L* galaxy (Mstar=10^9Msun) due to its high (mu=30-160) magnification. JWST/NIRSpec IFU data show unambiguous ionized gas outflows, while a deep MUSE follow-up reveals a significantly extended (~6") Lya structure around the galaxy, redshifted by ~400km/s. Intriguingly, the current ALMA data also display an extended (~3") and redshifted (~150km/s) [CII] structure potentially associated with Lya. The simple goal of this proposal is to improve the [CII] sensitivity by factors of >2-4 and conclusively map out its 3D distribution relative to Lya.
We also request 2.6-hour of JWST F466N imaging to map the Ha distribution which fortunately falls in the NIRcam narrow-band response to understand whether the extended Lya can be ascribed to an inflow or outflow scenario.

OBSERVING DESCRIPTION
To conclude whether ionized gas ouflow or cold gas inflow is the cause of the sinigicantly extended (~6") and red-shifted (~400 km/s) Lya structure (goal 3), we will also perform an additional 2.6-hrs narrow band imaging with JWST NIRCam/F466N.
As shown in Fig.4 in SJ, the wavelength of the H-alpha line from the target system is entirely covered, including the velocity offsets, fortunately, which allows us to answer which (inoized outflow vs. cold inflow) is the cause from the detection / non-detection of H-alpha line.

We use the standard subpixel (N=3) dithering.
One NIRCam pointing (2'x2') sufficiently covers the entire structure of the target system, where we have no restrictions for the roll angle.
The Ly-alpha fluxes with a 0."3-radius aperture at the several peak positions in the Lya structure are >~4e-18 erg/s/cm2. Assuming the Ly-alpha/H-alpha ratio from Case A recombination, we request the exposure time of 9566 sec (2.65hrs). Using the JWST ETC, this achieves the >~3sigma detection for the Ha emission from with the same size aperture. Note that this is a conservative estimate, because if the CGM gas is not fully ionized and the Ly-alpha escape fraction is < 1 in the outflow scenario, the H-alpha line will be more brightly detected than above assumptions.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NIRCAM-CENTER	RA: 06 00 5.6632 (90.0235967d)		
		Dec: -20 08 20.86 (-20.13913d)		
		Equinox: J2000		

Comments: This is the pointing center of B module in NIRCam observations.
Category=Galaxy
Description=[High-redshift galaxies]
Extended=NO

Observation

Proposal 4573, Observation 1: NIRCam Imaging Thu May 30 20:01:11 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Comments: Since our targets z6.1/6.2 and z6.3 are separated just by ~20'', our targets are fitted in the 2'x2' Field-of-View (FoV) of NIRCam. However, there is a bright star located east of source z6.3, and we have to ensure that its diffraction spikes do not overlap z6.3. Based on results from the JWST PSF simulation and general target visibility tools, we find that any position angle in the ranges of 29-60 will successfully avoid placing these spikes on the source and be schedulable.

We confirm that there is a preferable position for the FoV center of the module B where z6.1/6.2 and z6.3 (and even the other remaining multiple images z6.4, and z6.5 by chance) will be observed in any of the above position angles without falling in the ~5" detector gaps in the shorter wavelength image. We adopt this position for the FoV center in the NIRCam observation.

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NIRCAM-CENTER	RA: 06 00 5.6632 (90.0235967d) Dec: -20 08 20.86 (-20.13913d) Equinox: J2000		

Comments: This is the pointing center of B module in NIRCam observations.
Category=Galaxy
Description=[High-redshift galaxies]
Extended=NO

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRAMODULEBOX	4	STANDARD		1

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F466N+F444W	DEEP2	7	1	4	4	5239.544	
2	F115W	F466N+F444W	MEDIUM8	6	1	4	4	2490.931	
3	F200W	F466N+F444W	MEDIUM8	5	1	4	4	2061.46	

Special Requirements

Aperture PA Range 35 to 41 Degrees (V3 35.07457694 to 41.07457694)
Offset 87.0 arcsec, 1.0 arcsec
Background Limited. Background no more than 40th percentile above minimum

GQ Lup unveiled: Probing the Evolution of a Circumplanetary Disk (JWST/ALMA)

Cugno, Gabriele
2024.1.00780.S
JWST ID: 6739

ALMA proposal abstract: GQ Lup hosts a well-known accreting 10-30 MJ companion that interacts with the surrounding circumstellar disk. The companion has been confirmed to harbor a circumplanetary disk (CPD), offering a unique opportunity for comprehensive study across a wide range of wavelengths from the near- and mid-infrared with JWST to radio frequencies with ALMA. This proposal aims to provide the first empirical insights into the physical properties of a CPD by leveraging observations from NIRSpec, MIRI, and ALMA Band 7. These observations, coupled with radiative transfer models, will be sensitive to the geometry of the CPD, the properties of its grains and the presence of pebbles in optically thick or thin configurations. Moreover, GQ Lup presents a rare chance to investigate planet-disk interactions. Notably, GQ Lup B stands as the sole directly imaged companion with a documented orbit which is interacting with its parent disk at a separation substantial enough to resolve the kinematic perturbations it imparts on the surrounding gas. Through high-resolution observations of 12CO and 13CO, we aim to validate and refine our current modelling of planet disk interaction.

6739 - GQ Lup unveiled: Probing the Evolution of a Circumplanetary Disk

Cycle: 3, Proposal Category: GO

INVESTIGATORS

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Prof. Stefano Facchini (CoI) (ESA Member)	Universita di Milano
Dr. Myriam Benisty (CoI) (ESA Member)	Max Planck Institute for Astronomy
Prof. Richard Teague (CoI)	Massachusetts Institute of Technology
Dr. Jaehan Bae (CoI) (US Admin CoI)	University of Florida
Dr. Ruobing Dong (CoI) (CSA Member)	University of Victoria
Prof. Michael R. Meyer (CoI)	University of Michigan
Dr. Polychronis Alexandros Patapis (CoI) (ESA Member)	Eidgenossische Technische Hochschule Zurich (ETHZ)
Dr. Andrea Banzatti (CoI)	Texas State University
Dr. Tomas Stolker (CoI) (ESA Member)	Universiteit Leiden

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	GQ Lup NIRSpec	NIRSpec IFU Spectroscopy	(1) V-GQ-LUP
	2	Reference NIRSpec	NIRSpec IFU Spectroscopy	(2) V-RY-Lup
	3	GQ Lup MIRI	MIRI Imaging	(1) V-GQ-LUP
	4	Reference MIRI	MIRI Imaging	(2) V-RY-Lup

ABSTRACT

GQ Lup hosts a well-known accreting 10-30 MJ companion that interacts with the surrounding circumstellar disk. The companion has been confirmed to harbor a circumplanetary disk (CPD), offering a unique opportunity for comprehensive study across a wide range of wavelengthsfrom

the near- and mid-infrared with JWST to radio frequencies with ALMA. This proposal aims to provide the first empirical insights into the physical properties of a CPD by leveraging observations from NIRSpec, MIRI, and ALMA Band 7. These observations, coupled with radiative transfer models, will be sensitive to the geometry of the CPD, the properties of its grains and the presence of pebbles in optically thick or thin configurations. Moreover, GQ Lup presents a rare chance to investigate planet-disk interactions. Notably, GQ Lup B stands as the sole directly imaged companion with a documented orbit which is interacting with its parent disk at a separation substantial enough to resolve the kinematic perturbations it imparts on the surrounding gas. Through high-resolution observations of 12CO and 13CO, we aim to validate and refine our current modelling of planet disk interaction.
This is a joint ALMA-JWST program (ALMA PID: 2024.1.00780.S)

OBSERVING DESCRIPTION

We will observe the GQ Lup system with both NIRspec and MIRI imager. The goal is to detect and characterize a forming companion that is hosting a circumplanetary disk. The companion is located 0.7" away from the central star GQ Lup A.
We will first visit the target (GQ Lup A) and subsequently the reference star (RY Lup), necessary to properly remove the PSF. For each visit of a target, we will use both instruments MIRI and NIRSpec. Because wavefront drifts have larger impact at NIRSpec waveleghts, we will adopt the sequence MIRI SCIENCE --> NIRSpec SCIENCE --> NIRSpec REF --> MIRI REF (non-interruptible to be more time-efficient).

For NIRSpec, our observation is similar to PID1270, where the program aimed at a similar companion at similar separation. We will spend enough time on GQ Lup to obtain a SNR of 100 in the case no star were present. The residuals speckles will increase the noise by a factor 2-3 (based on experience with similar programs), meaning that we aim at a SNR of 30-50 in each channel. We will spend less time on the reference as it is not as important to be able to detect faint objects. We include a PA constraint to make sure that no PSF spike points in the same direction as the companion.

For MIRI, we will observe with F1280W, F1500W and F1800W with the SUB64 array. For each filter we will spend roughly 1 min on the target, as this is enough to reach high SNR. We will spend the same amount of time on the reference. Here, BFE will be one of the limiting factors for PSF subtraction, but since science target and reference have similar brightness, we expect to obtain a similar detector response. We verified with the ETC that the star will not saturate.

Proposal 6739 - Targets - GQ Lup unveiled: Probing the Evolution of a Circumplanetary Disk

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	V-GQ-LUP	RA: 15 49 12.0874 (237.3003642d) Dec: -35 39 5.42 (-35.65151d) Equinox: J2000	Proper Motion RA: -0.0011595206842507835 sec of time/yr Proper Motion Dec: -0.023328999941440998 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Star* *Description=[T Tauri stars]*				
(2)	V-RY-Lup	RA: 15 59 28.3865 (239.8682771d) Dec: -40 21 51.25 (-40.36424d) Equinox: J2000	Proper Motion RA: -10.963 mas/yr Proper Motion Dec: -22.23199994659808 mas/yr Parallax: 0.0065153" Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.* *Category=Star* *Description=[T Tauri stars]*				

Observation

Proposal 6739, Observation 1: GQ Lup NIRSpec

Tue Oct 22 22:00:35 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	V-GQ-LUP	RA: 15 49 12.0874 (237.3003642d) Dec: -35 39 5.42 (-35.65151d) Equinox: J2000	Proper Motion RA: -0.0011595206842507835 sec of time/yr Proper Motion Dec: -0.023328999941440998 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[T Tauri stars]

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	4-POINT-DITHER				

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSIRS2RAPID	30	1	false	true	NONE	4	4	1809.022	

Special Requirements

Aperture PA Range 78.97164917 to 108.97164917 Degrees (V3 300.0 to 330.0)
Aperture PA Range 198.97164917 to 228.97164917 Degrees (V3 60.0 to 90.0)

1 After 3
2 After 1
Group Observations 1, 2, 3, 4, Non-interruptible

Observation

Proposal 6739, Observation 2: Reference NIRSpec

Tue Oct 22 22:00:35 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	V-RY-Lup	RA: 15 59 28.3865 (239.8682771d) Dec: -40 21 51.25 (-40.36424d) Equinox: J2000	Proper Motion RA: -10.963 mas/yr Proper Motion Dec: -22.23199994659808 mas/yr Parallax: 0.0065153" Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[T Tauri stars]

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	4-POINT-DITHER				

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSIRS2RAPID	10	1	false	true	NONE	4	4	641.911	

Special Requirements

2 After 1
4 After 2
Group Observations 1, 2, 3, 4, Non-interruptible

Observation

Proposal 6739, Observation 3: GQ Lup MIRI

Tue Oct 22 22:00:35 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	V-GQ-LUP	RA: 15 49 12.0874 (237.3003642d) Dec: -35 39 5.42 (-35.65151d) Equinox: J2000	Proper Motion RA: -0.0011595206842507835 sec of time/yr Proper Motion Dec: -0.023328999941440998 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[T Tauri stars]

Template

Subarray
SUB64

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	POINT SOURCE	POSITIVE	DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1280W	FASTR1	15	11	1	Dither 1	4	44	59.584	
2	F1500W	FASTR1	15	11	1	Dither 1	4	44	59.584	
3	F1800W	FASTR1	15	11	1	Dither 1	4	44	59.584	

Special Requirements

1 After 3
Group Observations 1, 2, 3, 4, Non-interruptible

Proposal 6739 - Observation 4 - GQ Lup unveiled: Probing the Evolution of a Circumplanetary Disk

Observation

Proposal 6739, Observation 4: Reference MIRI Tue Oct 22 22:00:35 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	V-RY-Lup	RA: 15 59 28.3865 (239.8682771d) Dec: -40 21 51.25 (-40.36424d) Equinox: J2000	Proper Motion RA: -10.963 mas/yr Proper Motion Dec: -22.23199994659808 mas/yr Parallax: 0.0065153" Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[T Tauri stars]

Template

Subarray
SUB64

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	POINT SOURCE	POSITIVE	DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1280W	FASTR1	15	11	1	Dither 1	4	44	59.584	
2	F1500W	FASTR1	15	11	1	Dither 1	4	44	59.584	
3	F1800W	FASTR1	15	11	1	Dither 1	4	44	59.584	

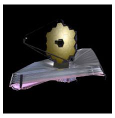
Special Requirements

4 After 2
Group Observations 1, 2, 3, 4, Non-interruptible

Of Dust and Dots: ALMA’s View of the Brightest of JWST’s Little Red Dots (JWST/ALMA)

Greene, Jenny
2024.1.00826.S
JWST ID: 6761

ALMA proposal abstract: JWST has revealed a previously unknown population of dust-reddened active galactic nuclei (AGN), so-called little red dots, raising questions about the abundance of SMBHs in the early universe. These red AGN may represent a transition phase from obscured, rapidly accreting BH seeds to unobscured, blue quasars, therefore providing a key laboratory for building our understanding of the dominant growth mechanisms in high-redshift SMBHs.We propose targeted ALMA follow-up of 3 of the brightest little red dots with existing JWST spectroscopy. Specifically, we propose low frequency observations simultaneously targeting the CO(7-6) and [CI](2-1) lines to probe multiple phases of the ISM and: i) search for molecular outflows via CO, determining if the LRDs are indeed in the "blowout" phase, removing their obscuring gas/dust, ii) probe the dispersion of neutral ISM via [CI], placing the LRDs on the M-sigma relation and determining whether the black holes are overmassive relative to their host galaxy, and iii) provide the deepest ever constraints on the cold dust content of the LRDs, which has yet to be detected despite the significant dust attenuation inferred from the optical SEDs



6761 - Of Dust and Dots: ALMA's View of the Brightest of JWST's Little Red Dots

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
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Dr. Rachel Bezanson (CoI)	University of Pittsburgh
Dr. Leindert Boogaard (CoI) (ESA Member)	Leiden Observatory
Dr. Gabriel Brammer (CoI) (ESA Member)	University of Copenhagen, Niels Bohr Institute
Mr. Aidan Patrick Cloonan (CoI)	University of Massachusetts - Amherst
Dr. Pratika Dayal (CoI) (ESA Member)	Kapteyn Astronomical Institute
Dr. Yoshinobu Fudamoto (CoI)	Chiba University
Dr. Seiji Fujimoto (CoI) (CSA Member)	University of Toronto
Dr. Andrew Goulding (CoI)	Princeton University
Dr. Vasily Kokorev (CoI)	University of Texas at Austin
Prof. Ivo Labbe (CoI)	Swinburne University of Technology
Dr. Joel Leja (CoI)	The Pennsylvania State University
Dr. Jorryt Matthee (CoI) (ESA Member)	Institute of Science and Technology Austria
Dr. Rohan Naidu (CoI)	Massachusetts Institute of Technology
Prof. Pascal Oesch (CoI) (ESA Member)	University of Geneva, Department of Astronomy
Dr. Sedona H. Price (CoI)	University of Pittsburgh
Dr. David Setton (CoI)	Princeton University
Prof. Justin Spilker (CoI)	Texas A & M University
Dr. Katherine Suess (CoI)	University of Colorado at Boulder
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JWST Proposal 6761 (Created: Thursday, October 3, 2024, 12:01:17PM Eastern Standard Time) - Overview

Name	*Institution*
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Dr. Anna G de Graaff (CoI) (ESA Member)	Max Planck Institute for Astronomy

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MIRI				
	1	MIRI 1000 and 2100	MIRI Imaging	(1) 45924

ABSTRACT

ALMA Proposal 2024.1.00826.S: One of the most surprising early JWST findings is a high abundance of Little Red Dots - very red and compact 3<z<8 sources seen in ~5% of all high-z galaxies over all JWST imaging fields. These sources must contain either significant obscured star formation or a dust-reddened AGN, and indeed many have spectroscopically-confirmed broad emission lines typical of AGN. Unlike most AGN, however, the little red dots show little evidence of AGN at any other wavelength including the X-ray and mid- IR. To solve this mystery requires substantially better constraints in the far-IR than currently exist -- the range in possible dust temperatures and the origin of the dust emission is completely unknown. We propose an in- depth study targeting the two little red dots with the best-quality existing data from ALMA and JWST to measure the total bolometric luminosity, constrain the dust temperature, and independently check the star formation rates of these enigmatic objects. These observations offer a comprehensive understanding of two archetypical little red dots that will guide all future ALMA campaigns targeting this new unusual population.

OBSERVING DESCRIPTION

As outlined in the scientific justification, while ALMA is the primary request in this program, the ALMA data alone cannot rule out all of the degeneracies between the possible far-infrared SEDs. Mid-infrared imaging from MIRI would allow us to constrain the hot dust content (if any) and provides the lever arm needed in combination with ALMA to understand the dust temperature and power source (see Figure 2). With MIRI data already in hand for RUBIES-1, we request MIRI imaging at F1000W and F2100W, similar rest-frame wavelengths to the data w already have for RUBIES-1 that allow us to constrain both the mid-infrared color and magnitude at >5micron restframe. To detect the faintest model in each filter, we request 11 minutes for F1000W and 30 minutes for F2100W (41 minutes science time for both filters). In total this corresponds to 1.3 hours of telescope time (including overheads). Our proposed data will provides a 3 uJy (~12 sigma) and 5 uJy (~4 sigma) detection limits in each filter. We estimate these limits using the ETC assuming 0.5" radius circular apertures under low background conditions. Following the established observation strategy of the SMILES survey (Williams et al. 2023) we will use the FASTR1 readout mode and 4 dithers, with 60 groups and 150 groups per exposure in F1000W and F2100W filters, respectively. We request that the observations be obtained during an October 21 - December 16, 2024 observation window, which corresponds to the lowest background conditions for A2744 that avoid the micrometiorite avoidance zone. We do not have a restriction on orientation. We do not request coordinated parallels. While MIRI 10um imaging will be obtained in A2744 in Cycle 3 by PID 5578 it covers a different region of the cluster and our target is completely outside the footprint. No approved programs exist targeting F2100W imaging in A2744.

Proposal 6761 - Targets - Of Dust and Dots: ALMA's View of the Brightest of JWST's Little Red Dots

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	45924	RA: 00 14 20.3419 (3.5847579d)		
		Dec: -30 20 37.07 (-30.34363d)		
		Equinox: J2000		

Comments:
Category=Galaxy
Description=[Active galactic nuclei, High-redshift galaxies]

Proposal 6761 - Observation 1 - Of Dust and Dots: ALMA's View of the Brightest of JWST's Little Red Dots

Observation

Proposal 6761, Observation 1: MIRI 1000 and 2100

Thu Oct 03 17:01:18 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	45924	RA: 00 14 20.3419 (3.5847579d) Dec: -30 20 37.07 (-30.34363d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Active galactic nuclei, High-redshift galaxies]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	4		1	1			LARGE

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1000W	FASTR1	60	1	1	Dither 1	4	4	666.01	
2	F2100W	FASTR1	150	1	1	Dither 1	4	4	1665.024	

Special Requirements

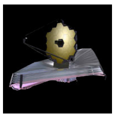
Background Limited. Background no more than 50th percentile above minimum

JWST-ALMA joint proposals (JWST)

Dissecting the kinematics of the central region z=6 QSO with ALMA and JWST

Roberta, Tripodi
JWST ID: 4574

JWST Proposal 4574 (Created: Monday, September 18, 2023 at 11:03:04 AM Eastern Standard Time) - Overview



4574 - Dissecting the kinematics of the central region of a z~6 QSO with ALMA and JWST

Cycle: 2, Proposal Category: GO

INVESTIGATORS

Name	***Institution***
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Dr. Chiara Feruglio (CoI) (ESA Member)	INAF, Osservatorio Astronomico di Trieste
Dr. Federico Lelli (CoI) (ESA Member)	INAF - Osservatorio Astrofisico di Arcetri
Dr. Sandro Tacchella (CoI) (ESA Member)	University of Cambridge
Dr. Jan Scholtz (CoI) (ESA Member)	University of Cambridge, Kavli Institute for Cosmology
Dr. Hannah Uebler (CoI) (ESA Member)	University of Cambridge
Prof. Roberto Maiolino (CoI) (ESA Member)	University of Cambridge
Dr. Luca Zappacosta (CoI) (ESA Member)	INAF, Osservatorio Astronomico di Roma
Dr. Enrico Piconcelli (CoI) (ESA Member)	INAF, Osservatorio Astronomico di Roma
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Dra. Federica Ricci (CoI) (ESA Member)	Universita degli Studi Roma Tre
Prof. Fabio La Franca (CoI) (ESA Member)	Universita' degli Studi Roma Tre
Dr. Francesca Civano (CoI) (US Admin CoI)	NASA Goddard Space Flight Center
Dr. Maria Vittoria Zanchettin (CoI) (ESA Member)	Scuola Internazionale Superiore di Studi Avanzati
Dr. Manuela Bischetti (CoI) (ESA Member)	Universita degli Studi di Trieste
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OBSERVATIONS

Folder	***Observation***	***Label***	***Observing Template***	***Science Target***
NIRCam Imaging of J2310+1855				

JWST Proposal 4574 (Created: Monday, September 18, 2023 at 11:03:04 AM Eastern Standard Time) - Overview

Folder	Observation	Label	Observing Template	Science Target
	1	Imaging J2310+1855	NIRCam Imaging	(1) J2310+1855

ABSTRACT

The goal of this ALMA-JWST joint proposal is to investigate the innermost region of the QSO host galaxy SDSS J2310+1855 at z~6, during the Epoch of Reionization, in order to unveil the host-galaxy stellar distribution, determining the possible presence and characteristics of a bulge-like component, and to constrain the black hole (BH) mass from gas kinematics. We propose to target the [CII] emission of J2310+1855 in order to analyse the rotation curve of the QSO's host-galaxy down to 100 physical pc scales and to investigate the properties of the host galaxy. We aim at pushing dynamical studies to high-z using for the first time very high resolution ALMA observations jointly with JWST-NIRCam, which probes the stellar mass of the host galaxy. This will give us a more accurate and less-biased estimate of BH mass in comparison to those currently obtained via the virial relation and the broad lines (both UV and optical rest frame) alone. This pilot programme will be used to design and optimise future ALMA observations of a larger sample of high-z QSOs to test the reliability of black holes mass estimates and explore the early quasar-galaxy coevolution in a statistical sound manner.

OBSERVING DESCRIPTION

Observational feasibility of JWST-NIRCam: The QSO-host galaxy decomposition has been proven to be feasible with JWST-NIRCam for QSOs at z>6 (Ding+22). We need NIRCam observations in order to determine the properties of the stellar component in QSO J2310+1855, such as the stellar mass, the effective radius and Sérsic index of the stellar distribution. Images will be taken in two filters (F150W and F410M), with a wide and medium wavelength coverage respectively, in order to constrain the stellar mass and size. We choose F410M as red filter since it has a very good PSF (comparable with that of F356W) and we do not expect to found any bright emission lines that can contaminate our measure, given the redshift of the target QSO (z=6.0031). This is the only red filter that ensure the latter condition. F150W, as blue filter, has very good PSF, comparable with the required resolution of the ALMA observation. The detection of the underlying host galaxy requires a careful decomposition of the two-dimensional light distribution to separate the point-like quasar from its host galaxy. This will be perfomed by JWST experts in our team, using refined software tools (e.g., galight, https://galight.readthedocs.io/en/latest; ForcePho, https://github.com/bd-j/forcepho). This decomposition will give us
results on the stellar properties. Using the JWST ETC, to ensure an high S/N detection we require a total exposure of 3200 seconds in the two filters (F150W and F410M), that can be obtained simultaneously. We estimated the magnitude of the host galaxy assuming a stellar mass of ~1e10 Msun and a star formation rate history with an age of 10 Myr, typical of high-z galaxies. This leads to an AB magnitude in band H of ~22. The rough estimate for the stellar mass is based on the estimates of the dynamical mass, BH mass, and gas mass already available for J2310+1855, and given the results of the dynamical modelling of Tripodi+22 (A&A, 665, A107). A 4x4 primary and sub-pixel dithering pattern is employed to mitigate

cosmic ray hits and bad pixels in the detector and to ensure sub-pixel resampling during the stacking step. We used the BRIGHT1 read-out mode and we avoided saturation. The total exposure time corresponds to 32 total integrations, with 5 group per integration, 2 integrations per exposure, and 16 exposures for specification (as also done in Ding+22). We have verified that there are no duplicate JWST observations, using the MAST Data Discovery Portal.

Proposal 4574 - Targets - Dissecting the kinematics of the central region of a z~6 QSO with ALMA and JWST

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	J2310+1855	RA: 23 10 38.8800 (347.6620000d)		
		Dec: +18 55 19.70 (18.92214d)		
		Equinox: J2000		

Comments: z = 6.003
Category=Galaxy
Description=[Active galactic nuclei, High-redshift galaxies, Quasars]
Extended=NO

Proposal 4574 - Observation 1 - Dissecting the kinematics of the central region of a z~6 QSO with ALMA and JWST

Observation

Proposal 4574, Observation 1: Imaging J2310+1855 — Mon Sep 18 16:03:04 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	J2310+1855	RA: 23 10 38.8800 (347.6620000d) Dec: +18 55 19.70 (18.92214d) Equinox: J2000		

Comments: z = 6.003
Category=Galaxy
Description=[Active galactic nuclei, High-redshift galaxies, Quasars]
Extended=NO

Template

Module	Subarray	Target Placement
B	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRAMODULEBOX	4	STANDARD		4

Spectral Elements

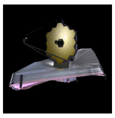
#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F150W	F410M	BRIGHT1	5	2	32	16	3263.978	155971

Special Requirements

Offset 35.0 arcsec, -42.0 arcsec

The most typical planet formation in the most typical environments

Ryan, Boyden
JWST ID: 6130



6130 - The most typical planet formation in the most typical environments

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Ryan Boyden (PI)	**The University of Virginia**
Dr. Nicholas Ballering (CoI)	The University of Virginia
Prof. Ilse Cleeves (CoI)	The University of Virginia
Prof. Josh Eisner (CoI)	University of Arizona
Dr. Thomas Haworth (CoI) (ESA Member)	Queen Mary University of London
Dr. Jinyoung Serena Kim (CoI)	University of Arizona
Dr. Min Fang (CoI)	Purple Mountain Observatory, CAS
Rachel Erin Gross (CoI)	The University of Virginia
Prof. Jonathan Charles Tan (CoI) (ESA Member)	Chalmers University of Technology

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MIRI				
	1	SRC47	MIRI Medium Resolution Spectroscopy	(1) SRC47
	5	SRC25	MIRI Medium Resolution Spectroscopy	(5) SRC25
	6	SRC27	MIRI Medium Resolution Spectroscopy	(6) SRC27
	7	SRC16	MIRI Medium Resolution Spectroscopy	(7) SRC16
	8	SRC23	MIRI Medium Resolution Spectroscopy	(8) SRC23
	9	SRC38	MIRI Medium Resolution Spectroscopy	(9) SRC38
	10	SRC55	MIRI Medium Resolution Spectroscopy	(10) SRC55
	11	SRC50	MIRI Medium Resolution Spectroscopy	(11) SRC50

ABSTRACT

The inner (<10 AU) regions of protoplanetary disks are where most planets form locally, therefore understanding the structure, composition, and evolution of the inner disk is crucial to interpreting the demographics of exoplanets. We propose joint JWST MIRI-MRS and ALMA 0.87 mm observations of 11 protoplanetary disks in the Orion NGC 1977 region. NGC 1977 is a young stellar cluster with a UV radiation field that is weaker than those found at the centers of O-star-hosting clusters, but stronger than those found in low-mass star-forming regions (SFRs). These “intermediate” UV fields are the most common external UV radiation field strengths found in Galactic SFRs, yet disk properties in intermediately irradiated SFRs remain poorly constrained. Theoretical work suggests that intermediate external UV fields may dramatically affect the chemical evolution of the inner regions of protoplanetary disks through enhanced irradiation of the outer disk and subsequent mixing of the outer and inner disk. Our program will test this hypothesis by measuring the inner disk chemical inventories and outer disk mm dust reservoirs over a representative sample of intermediately irradiated disks. With these measurements, we will be able to 1) determine whether intermediately irradiated disks have different inner disk compositions than disks in low-mass (i.e., weakly irradiated) SFRs, and 2) identify the dominant physical mechanisms driving the observed chemical differences (or lack thereof). This program will constrain the initial conditions of planet formation in the most common environments of star formation, and it will complement ongoing Cycle 1/2 MIRI-MRS surveys of other disk populations.

OBSERVING DESCRIPTION

We propose to use JWST MIRI MRS to observe 11 disks in the NGC 1977 cluster. Since we aim to obtain complete spectral coverage, we require exposures in all three grating settings: SHORT (A), MEDIUM (B), and LONG (C). Each observation begins with Target Acquisition to minimize fringing which can reduce the data quality. Exposure times are determined such that we achieve a S/N > 300 between 6 and 18 microns, where the main spectral features needed for our science are located. To maximize the scientific output of this program and improve astrometric solutions of individual MRS exposures, we take simultaneous imaging in the F770W filter at no extra cost. Since we expect the inner-disk mid-IR emission to be essentially point-like with MRS, we adopt a 4-point dither pattern.

Proposal 6130 - Targets - The most typical planet formation in the most typical environments

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SRC47	RA: 05 35 28.6900 (83.8695417d) Dec: -04 48 16.40 (-4.80456d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	
Comments: *Category=Star* *Description=[Protoplanetary disks]* *Extended=NO*				
(5)	SRC25	RA: 05 35 21.5100 (83.8396250d) Dec: -04 50 45.30 (-4.84592d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	
Comments: *Category=Star* *Description=[Protoplanetary disks]* *Extended=NO*				
(6)	SRC27	RA: 05 35 32.7200 (83.8863333d) Dec: -04 50 11.80 (-4.83661d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	
Comments: *Category=Star* *Description=[Protoplanetary disks]* *Extended=NO*				
(7)	SRC16	RA: 05 35 18.3900 (83.8266250d) Dec: -04 53 23.60 (-4.88989d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	
Comments: *Category=Star* *Description=[Protoplanetary disks]* *Extended=NO*				
(8)	SRC23	RA: 05 35 3.7100 (83.7654583d) Dec: -04 50 53.10 (-4.84808d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	
Comments: *Category=Star* *Description=[Protoplanetary disks]* *Extended=NO*				
(9)	SRC38	RA: 05 35 5.8600 (83.7744167d) Dec: -04 48 43.30 (-4.81203d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	
Comments: *Category=Star* *Description=[Protoplanetary disks]* *Extended=NO*				
(10)	SRC55	RA: 05 35 34.5000 (83.8937500d) Dec: -04 46 54.90 (-4.78192d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	
Comments: *Category=Star* *Description=[Protoplanetary disks]* *Extended=NO*				

(11)	SRC50	RA: 05 35 35.2230 (83.8967625d)	Proper Motion RA: 0.4 mas/yr
		Dec: -04 47 39.72 (-4.79437d)	Proper Motion Dec: 0.4 mas/yr
		Equinox: J2000	Epoch of Position: 2000

Comments:
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Proposal 6130 - Observation 1 - The most typical planet formation in the most typical environments

Observation

Proposal 6130, Observation 1: SRC47

Tue Mar 05 20:01:08 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SRC47	RA: 05 35 28.6900 (83.8695417d) Dec: -04 48 16.40 (-4.80456d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	

Comments:
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	FAST	6	1	1	16.65	175492

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	YES	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	POINT SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175492
1	LONG(C)	MRSLONG		FASTR1	13	5	1	Dither 1	4	20	765.911	175492
1	LONG(C)	MRSSHORT		FASTR1	13	5	1	Dither 1	4	20	765.911	175492
2		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175492
2	MEDIUM(B)	MRSLONG		FASTR1	13	5	1	Dither 1	4	20	765.911	175492
2	MEDIUM(B)	MRSSHORT		FASTR1	13	5	1	Dither 1	4	20	765.911	175492
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175492
3	SHORT(A)	MRSLONG		FASTR1	13	5	1	Dither 1	4	20	765.911	175492
3	SHORT(A)	MRSSHORT		FASTR1	13	5	1	Dither 1	4	20	765.911	175492

Proposal 6130 - Observation 5 - The most typical planet formation in the most typical environments

Observation

Proposal 6130, Observation 5: SRC25

Tue Mar 05 20:01:08 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	SRC25	RA: 05 35 21.5100 (83.8396250d)	Proper Motion RA: 0.4 mas/yr	
		Dec: -04 50 45.30 (-4.84592d)	Proper Motion Dec: 0.4 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	FAST	6	1	1	16.65	175558

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	YES	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	POINT SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175558
1	LONG(C)	MRSLONG		FASTR1	13	5	1	Dither 1	4	20	765.911	175558
1	LONG(C)	MRSSHORT		FASTR1	13	5	1	Dither 1	4	20	765.911	175558
2		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175558
2	MEDIUM(B)	MRSLONG		FASTR1	13	5	1	Dither 1	4	20	765.911	175558
2	MEDIUM(B)	MRSSHORT		FASTR1	13	5	1	Dither 1	4	20	765.911	175558
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175558
3	SHORT(A)	MRSLONG		FASTR1	13	5	1	Dither 1	4	20	765.911	175558
3	SHORT(A)	MRSSHORT		FASTR1	13	5	1	Dither 1	4	20	765.911	175558

Proposal 6130 - Observation 6 - The most typical planet formation in the most typical environments

Observation

Proposal 6130, Observation 6: SRC27

Tue Mar 05 20:01:08 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	SRC27	RA: 05 35 32.7200 (83.8863333d) Dec: -04 50 11.80 (-4.83661d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	

Comments:
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	FAST	6	1	1	16.65	175563

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	YES	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	POINT SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175563
1	LONG(C)	MRSLONG		FASTR1	16	4	1	Dither 1	4	16	743.711	175563
1	LONG(C)	MRSSHORT		FASTR1	16	4	1	Dither 1	4	16	743.711	175563
2		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175563
2	MEDIUM(B)	MRSLONG		FASTR1	16	4	1	Dither 1	4	16	743.711	175563
2	MEDIUM(B)	MRSSHORT		FASTR1	16	4	1	Dither 1	4	16	743.711	175563
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175563
3	SHORT(A)	MRSLONG		FASTR1	16	4	1	Dither 1	4	16	743.711	175563
3	SHORT(A)	MRSSHORT		FASTR1	16	4	1	Dither 1	4	16	743.711	175563

Proposal 6130 - Observation 7 - The most typical planet formation in the most typical environments

Observation

Proposal 6130, Observation 7: SRC16

Tue Mar 05 20:01:08 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(7)	SRC16	RA: 05 35 18.3900 (83.8266250d)	Proper Motion RA: 0.4 mas/yr	
		Dec: -04 53 23.60 (-4.88989d)	Proper Motion Dec: 0.4 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	FAST	6	1	1	16.65	175574

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	YES	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	POINT SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175574
1	LONG(C)	MRSLONG		FASTR1	16	4	1	Dither 1	4	16	743.711	175574
1	LONG(C)	MRSSHORT		FASTR1	16	4	1	Dither 1	4	16	743.711	175574
2		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175574
2	MEDIUM(B)	MRSLONG		FASTR1	16	4	1	Dither 1	4	16	743.711	175574
2	MEDIUM(B)	MRSSHORT		FASTR1	16	4	1	Dither 1	4	16	743.711	175574
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175574
3	SHORT(A)	MRSLONG		FASTR1	16	4	1	Dither 1	4	16	743.711	175574
3	SHORT(A)	MRSSHORT		FASTR1	16	4	1	Dither 1	4	16	743.711	175574

Proposal 6130 - Observation 8 - The most typical planet formation in the most typical environments

Observation

Proposal 6130, Observation 8: SRC23

Tue Mar 05 20:01:08 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(8)	SRC23	RA: 05 35 3.7100 (83.7654583d) Dec: -04 50 53.10 (-4.84808d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	

Comments:
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	FAST	6	1	1	16.65	175579

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	YES	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	POINT SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175579
1	LONG(C)	MRSLONG		FASTR1	13	5	1	Dither 1	4	20	765.911	175579
1	LONG(C)	MRSSHORT		FASTR1	13	5	1	Dither 1	4	20	765.911	175579
2		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175579
2	MEDIUM(B)	MRSLONG		FASTR1	13	5	1	Dither 1	4	20	765.911	175579
2	MEDIUM(B)	MRSSHORT		FASTR1	13	5	1	Dither 1	4	20	765.911	175579
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175579
3	SHORT(A)	MRSLONG		FASTR1	13	5	1	Dither 1	4	20	765.911	175579
3	SHORT(A)	MRSSHORT		FASTR1	13	5	1	Dither 1	4	20	765.911	175579

Proposal 6130 - Observation 9 - The most typical planet formation in the most typical environments

Observation

Proposal 6130, Observation 9: SRC38 Tue Mar 05 20:01:08 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 9:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(9)	SRC38	RA: 05 35 5.8600 (83.7744167d)	Proper Motion RA: 0.4 mas/yr	
		Dec: -04 48 43.30 (-4.81203d)	Proper Motion Dec: 0.4 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	FAST	6	1	1	16.65	175585

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	YES	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	POINT SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175585
1	LONG(C)	MRSLONG		FASTR1	30	5	1	Dither 1	4	20	1709.425	175585
1	LONG(C)	MRSSHORT		FASTR1	30	5	1	Dither 1	4	20	1709.425	175585
2		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175585
2	MEDIUM(B)	MRSLONG		FASTR1	30	5	1	Dither 1	4	20	1709.425	175585
2	MEDIUM(B)	MRSSHORT		FASTR1	30	5	1	Dither 1	4	20	1709.425	175585
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175585
3	SHORT(A)	MRSLONG		FASTR1	30	5	1	Dither 1	4	20	1709.425	175585
3	SHORT(A)	MRSSHORT		FASTR1	30	5	1	Dither 1	4	20	1709.425	175585

Observation

Proposal 6130, Observation 10: SRC55

Tue Mar 05 20:01:08 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 10:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(10)	SRC55	RA: 05 35 34.5000 (83.8937500d) Dec: -04 46 54.90 (-4.78192d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	

Comments:
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	FAST	6	1	1	16.65	175598

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	YES	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	POINT SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175598
1	LONG(C)	MRSLONG		FASTR1	40	5	1	Dither 1	4	20	2264.433	175598
1	LONG(C)	MRSSHORT		FASTR1	40	5	1	Dither 1	4	20	2264.433	175598
2		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175598
2	MEDIUM(B)	MRSLONG		FASTR1	40	5	1	Dither 1	4	20	2264.433	175598
2	MEDIUM(B)	MRSSHORT		FASTR1	40	5	1	Dither 1	4	20	2264.433	175598
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175598
3	SHORT(A)	MRSLONG		FASTR1	40	5	1	Dither 1	4	20	2264.433	175598
3	SHORT(A)	MRSSHORT		FASTR1	40	5	1	Dither 1	4	20	2264.433	175598

Observation

Proposal 6130, Observation 11: SRC50

Tue Mar 05 20:01:08 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 11:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(11)	SRC50	RA: 05 35 35.2230 (83.8967625d) Dec: -04 47 39.72 (-4.79437d) Equinox: J2000	Proper Motion RA: 0.4 mas/yr Proper Motion Dec: 0.4 mas/yr Epoch of Position: 2000	

Comments:
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	FAST	6	1	1	16.65	175686

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	YES	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	POINT SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175686
1	LONG(C)	MRSLONG		FASTR1	40	5	1	Dither 1	4	20	2264.433	175686
1	LONG(C)	MRSSHORT		FASTR1	40	5	1	Dither 1	4	20	2264.433	175686
2		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175686
2	MEDIUM(B)	MRSLONG		FASTR1	40	5	1	Dither 1	4	20	2264.433	175686
2	MEDIUM(B)	MRSSHORT		FASTR1	40	5	1	Dither 1	4	20	2264.433	175686
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	175686
3	SHORT(A)	MRSLONG		FASTR1	40	5	1	Dither 1	4	20	2264.433	175686
3	SHORT(A)	MRSSHORT		FASTR1	40	5	1	Dither 1	4	20	2264.433	175686

Mapping Cold Gas and Star Formation in Gas Rich Post-Starburst Galaxies Near Cosmic Noon

David, Setton

JWST ID: 6719

6719 - Mapping Cold Gas and Star Formation in Gas Rich Post-Starburst Galaxies Near Cosmic Noon

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. David Setton (PI)	**Princeton University**
Margaret Verrico (CoI)	University of Illinois at Urbana - Champaign
Dr. Andrew Goulding (CoI)	Princeton University
Dr. Rachel Bezanson (CoI)	University of Pittsburgh
Prof. Jenny Emma Greene (CoI)	Princeton University
Prof. Mariska Kriek (CoI) (ESA Member)	Leiden Observatory
Dr. Katherine Suess (CoI)	University of Colorado at Boulder
Prof. Justin Spilker (CoI)	Texas A & M University
Vincenzo Donofrio (CoI)	Texas A & M University
Dr. Desika Narayanan (CoI)	University of Florida
Prof. Robert Feldmann (CoI) (ESA Member)	Universitat Zurich

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
J0907+0423				
	1	G395M	NIRSpec IFU Spectroscopy	(1) J0907+0423
J9010+0218				
	2	G395M	NIRSpec IFU Spectroscopy	(2) J0910+0218
J1157+0132				
	3	G395M	NIRSpec IFU Spectroscopy	(3) J1157+0132

ABSTRACT

While quenching mechanisms in massive galaxies are hotly debated, it is generally agreed that the removal of the neutral interstellar medium (ISM) is a crucial precursor to the shutdown of star formation. As such, the detection of significant residual molecular gas reservoirs (>10^10.8 Msun) in massive (~10^11.5 Msun) post-starburst galaxies caught ~100 Myrs after shutting down at z~0.7 has challenged assumptions about how the quenching progresses. A number of models have been proposed to explain the lack of star formation in these systems, including turbulent, outflowing, diffuse, or still-star-forming dusty ISMs, but existing data has yet to provide discriminating evidence. We propose to leverage the high resolution and sensitivity of ALMA, along with the near-IR spectroscopic coverage of the JWST/NIRSpec G395M IFU, to map the molecular and ionized gas the three most gas-rich post-starburst galaxies in the SQuIGGLE sample. Together, these diagnostics will conclusively distinguish between the aforementioned models to ascertain why such large molecular gas reservoirs exist in systems that have, by all rest-optical measures, ended their life as star forming galaxies.

This proposal is being submitted jointly with ALMA Proposal 2024.1.01064.S

OBSERVING DESCRIPTION

We request NIRSpec G395M IFU observations of three galaxies to spatially resolve Paschen Alpha emission. In order to assess the necessary JWST exposure time, we take the best-fitting continuum models of our galaxies from Suess et al. 2022, which are constrained at ~3 microns by WISE W1 photometry. All galaxies are quite bright in the NIR, with W1 magnitudes of ~18 AB. We supply these curves to the ETC with a deliberately broad (~1.4") Sersic effective radius, among the largest observed for any of the galaxies in the SQuIGGLE sample. We then simulate two star formation scenarios, SFR=100 Msun/yr (~2-5x lower than the SFR required to deplete the gas reservoirs in 100 Myr) and 5 Msun/yr, converting to Paschen Alpha luminosity following Neufeld et al. 2024. We then tune our exposure times such that the continuum signal to noise in individual spaxels within 1" is >3. We find that, at the redshift of our sources, this corresponds to 30 minutes of science-time-per-galaxy. In order to achive this while oversampling the PSF, we divide this integration into an 8 point small cycle dither pattern, with 15 groups/integration using the NSIRS2 readout mode.

These exposure times will result in an integrated signal-to-noise of ~15 in the continuum at 3 microns, the location of Paschen Alpha, allowing us to be sensitive to star formation rates on the order of ~2 Msun/year throughout the galaxy at the assumed continuum level. If star formation rates are high or there are significant ionized outflows, we will easily spatially resolve the PaAlpha at our requested sensitivity. Because we are using the reddest arm of NIRSpec, we elect not to perform any dedicated background observations. We configure our observations within the ETC and the

APT and find that our 1.5 hours of science time results in a total JWST charged time of 4.7 hours, a factor of 3 lower than our requested ALMA time of 15.47 hours.

Proposal 6719 - Targets - Mapping Cold Gas and Star Formation in Gas Rich Post-Starburst Galaxies Near Cosmic Noon

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	J0907+0423	RA: 09 07 57.8798 (136.9911658d) Dec: +04 23 3.33 (4.38426d) Equinox: J2000		
Comments: *Category=Galaxy* *Description=[Elliptical galaxies, Infrared galaxies]*				
(2)	J0910+0218	RA: 09 10 28.5744 (137.6190600d) Dec: +02 18 33.52 (2.30931d) Equinox: J2000		
Comments: *Category=Galaxy* *Description=[Elliptical galaxies, Interacting galaxies]*				
(3)	J1157+0132	RA: 11 57 57.3096 (179.4887900d) Dec: +01 32 15.12 (1.53753d) Equinox: J2000		
Comments: *Category=Galaxy* *Description=[Elliptical galaxies, Interacting galaxies]*				

Proposal 6719 - Observation 1 - Mapping Cold Gas and Star Formation in Gas Rich Post-Starburst Galaxies Near Cosmic Noon

Observation

Proposal 6719, Observation 1: G395M

Wed Aug 21 18:00:19 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	J0907+0423	RA: 09 07 57.8798 (136.9911658d) Dec: +04 23 3.33 (4.38426d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Elliptical galaxies, Infrared galaxies]

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	8	

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395M/F290LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	198486

Observation

Proposal 6719, Observation 2: G395M

Wed Aug 21 18:00:19 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	J0910+0218	RA: 09 10 28.5744 (137.6190600d) Dec: +02 18 33.52 (2.30931d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Elliptical galaxies, Interacting galaxies]

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	8	

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395M/F290LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	198486

Observation

Proposal 6719, Observation 3: G395M

Wed Aug 21 18:00:19 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	J1157+0132	RA: 11 57 57.3096 (179.4887900d) Dec: +01 32 15.12 (1.53753d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Elliptical galaxies, Interacting galaxies]

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	8	

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395M/F290LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	198486

Resolving the early phase of co-evolution of galaxies and supermassive black holes within cosmic web filaments

Hideki, Umehata
JWST ID: 6751

6751 - Resolving the early phase of co-evolution of galaxies and supermassive black holes within cosmic web filaments

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	***Institution***
Dr. Hideki Umehata (PI)	**Nagoya University**
Prof. Kotaro Kohno (CoI)	University of Tokyo, Institute of Astronomy
Dr. Yoichi Tamura (CoI)	Nagoya University
Dr. Yuichi Matsuda (CoI)	National Astronomical Observatory of Japan (NAOJ)
Dr. Kouichiro Nakanishi (CoI)	National Astronomical Observatory of Japan (NAOJ)
Prof. Rob J. Ivison (CoI) (ESA Member)	European Southern Observatory - Germany
Prof. Ian Smail (CoI) (ESA Member)	Durham Univ.
Dr. Mariko Kubo (CoI)	Tohoku University, Astronomical Institute
Dr. Mark Swinbank (CoI) (ESA Member)	Durham Univ.
Mr. Masato Hagimoto (CoI)	Nagoya University
Mr. Chihiro Imamura (CoI)	Nagoya University
HUANG Shuo (CoI)	National Astronomical Observatory of Japan (NAOJ)
Norika Okauchi (CoI)	Nagoya University

OBSERVATIONS

Folder	***Observation***	***Label***	***Observing Template***	***Science Target***
Observation Folder				
	1	MIRI F770W (a)	MIRI Imaging	(1) ADF22a
	2	MIRI F770W (b)	MIRI Imaging	(2) ADF22b

ABSTRACT

The cosmic web filaments are thought to fuel galaxies and SMBHs and thus growing galaxies within a remarkable gas filament provides a unique laboratory. In this regard, invaluable targets have been discovered at a z=3.1 proto-cluster core. Numerous bright dusty star-forming galaxies (DSFGs), often hosting X-ray AGNs, are situated within Mpc-scale Lyman-alpha filaments. These findings reinforce the idea that the cosmic web plays a key role in fueling the high level activity. To delve deeper into the mechanisms driving the rapid concurrent growth of galaxies and SMBHs, two critical aspects remain unexplored: (a) detailed views on the gas kinematics within the host galaxy and (b) precise evaluations of the (obscured) AGN activity. Building on a successful pilot survey that revealed spiral arms, bar flows, and a bright dusty core in the brightest DSFG, we now propose (i) [CII] mapping at 0.15" resolution and (ii) JWST/MIRI imaging for the six brightest DSFGs. Leveraging extensive existing JWST/ALMA data, we aim to uncover the drivers behind intense starburst activity and elucidate how the co-evolution of galaxies and SMBHs unfolds during these early, obscured stages. (ALMA Cy11 ID: 2024.1.00335.S)

OBSERVING DESCRIPTION

We will observe 6 DSFGs with MIRI in the imaging mode. Our aim is to detect hot dust emission associated with AGN activity. For this, two MIRI filter bands are proposed - F770W and F2100W. For each, two fields are requested to cover the 6 targets in total. The highest spatial resolution F770W filter (0.25 arcsec or 2kpc) is key to measure the spatial transition between the rest-frame near-IR emission from stars and that from heated dust at high redshift. The 2100W filter is vital to detect or put a constraint on the hot dust associated with a various levels of AGN luminosity. The fiducial 4-point dither pattern is adopted to ensure optimal PSF reconstruction. On the FULL array, the FAST readout mode is used for the detector, with 43 groups and 4 integrations per dither point for the F770W exposures, and 25 groups and 8 integrations for the F2100W exposures, yielding 1900s and 2300s per pointing for F770W and F2100W, respectively. Here the reduced count rate is considered for F2100W observation. According to the JWST ETC, we will achieve a 5sigma point source limit of 25.0, and 22.4 for F770W and F2100W (AB mag). These are >1dex improvement compared to Spizter, and allows us to detect AGN component at mid-IR wavelengths above 5 sigma for the bright DSFGs (for a various range of AGN activity. cf: Scientific Justification).

Proposal 6751 - Targets - Resolving the early phase of co-evolution of galaxies and supermassive black holes within cosmic web filam...

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	ADF22a	RA: 22 17 33.7000 (334.3904167d) Dec: +00 17 48.80 (.29689d) Equinox: J2000		
Comments: Category=Clusters of Galaxies Description=[High-redshift clusters]				
(2)	ADF22b	RA: 22 17 33.7267 (334.3905279d) Dec: +00 15 58.20 (.26617d) Equinox: J2000		
Comments: Category=Galaxy Description=[Active galactic nuclei, Starburst galaxies]				

Observation

Proposal 6751, Observation 1: MIRI F770W (a)
Tue Sep 17 16:01:32 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	ADF22a	RA: 22 17 33.7000 (334.3904167d) Dec: +00 17 48.80 (.29689d) Equinox: J2000		

Comments:
Category=Clusters of Galaxies
Description=[High-redshift clusters]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	POINT SOURCE	POSITIVE	DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	43	4	1	Dither 1	4	16	1942.528	
2	F2100W	FASTR1	25	8	1	Dither 1	4	32	2297.733	

Special Requirements

Aperture PA Range 70 to 85 Degrees (V3 65.16455103 to 80.16455103)
Aperture PA Range 240 to 250 Degrees (V3 235.16455103 to 245.16455103)

Observation

Proposal 6751, Observation 2: MIRI F770W (b)

Tue Sep 17 16:01:32 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	ADF22b	RA: 22 17 33.7267 (334.3905279d) Dec: +00 15 58.20 (.26617d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Active galactic nuclei, Starburst galaxies]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	POINT SOURCE	POSITIVE	DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	43	4	1	Dither 1	4	16	1942.528	
2	F2100W	FASTR1	25	8	1	Dither 1	4	32	2297.733	

Special Requirements

Aperture PA Range 70 to 85 Degrees (V3 65.16455103 to 80.16455103)
Aperture PA Range 240 to 250 Degrees (V3 235.16455103 to 245.16455103)