

JWST

Pocket Guide

June 2023



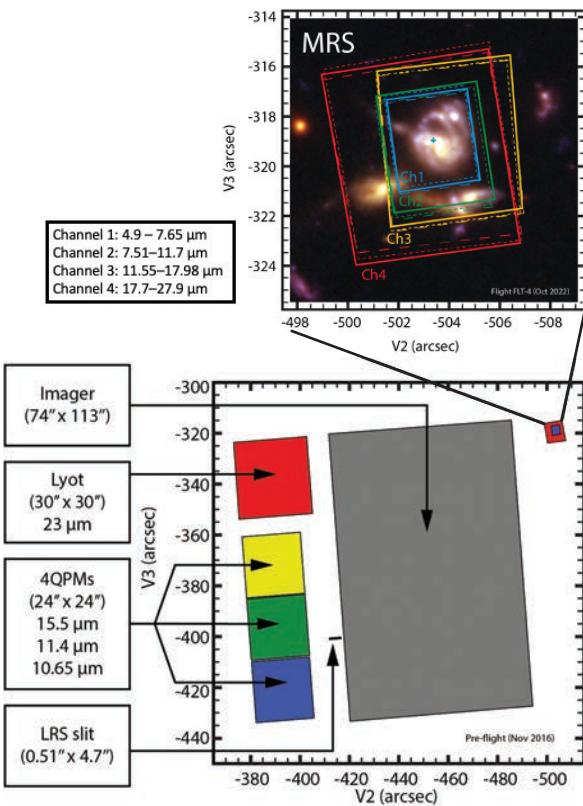


Observing Modes

Observing Mode	Wavelength Coverage (μm)	FOV/Slit Size (arcsec)	Pixel Scale (arcsec/pixel)	Comment
Imaging	5.6 – 25.5	74 x 113	0.11	Subarrays Available
4QPM Coronagraphic Imaging	10.65, 11.4, 15.5	24 x 24	0.11	Inner working Angle = $1\lambda/D$
Lyot Coronagraphic Imaging	23	30 x 30	0.11	Inner working Angle = $3.3\lambda/D$
Low Resolution Spectroscopy (LRS)	5 – 12	0.51 x 4.7 (slit)	0.11	Single Object Slitless Mode Available R ~ 100
Medium Resolution Spectroscopy (MRS)	4.9 – 27.9	3.9 to 7.7 (IFU)	0.196 – 0.273	R $\sim 2,500$

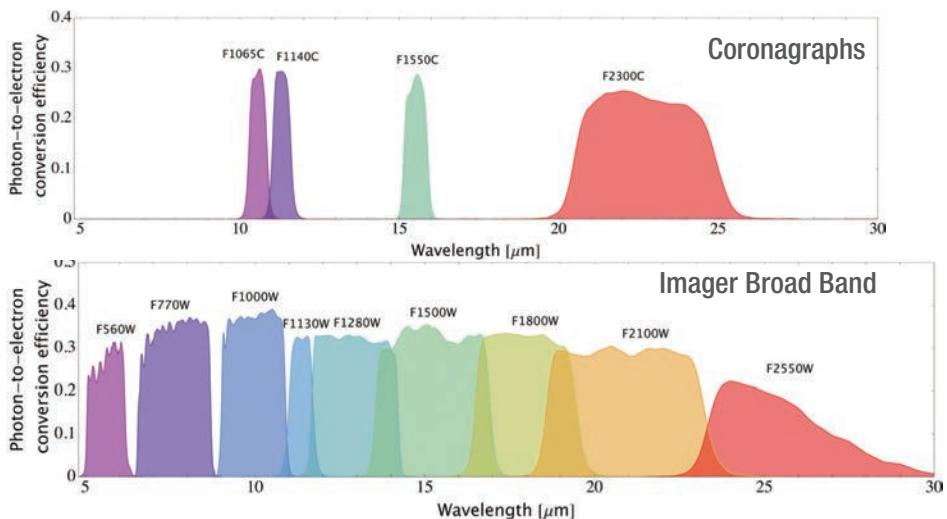
Imager contains one and MRS contains two Raytheon SiAs impurity band conduction (IBC) detectors

Field of View





Filter Transmission Profiles



Bright Source Limits*

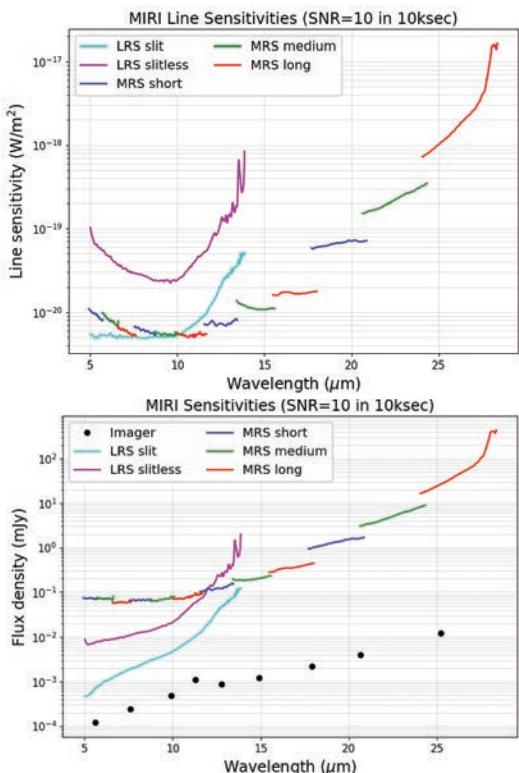
Filter	Flux Density
F560W	3.4 mJy
F770W	2.9 mJy
F1000W	5.3 mJy
F1130W	20 mJy
F1280W	10 mJy
F1500W	11 mJy
F1800W	19 mJy
F2100W	21 mJy
F2550W	43 mJy
MRS Channel 1 (at 6.2μm)	3.8 Jy
MRS Channel 2 (at 9.6μm)	4.0 Jy
MRS Channel 3 (at 14.8μm)	6.3 Jy
MRS Channel 4 (at 23.0μm)	24 Jy
LRS Slit (at 7.5μm)	80.6 mJy
LRS Slitless (at 7.5μm)	1024 mJy

*Brightness limit set at 70% full-well capacity for largest subarray, no background, NGROUPS = 5.
Subarrays for brighter sources available.

Limits are for continuum point sources.

Sensitivities

Sensitivity plots based on preliminary in-flight measurements. The ETC should be used to obtain the most up-to-date numbers.

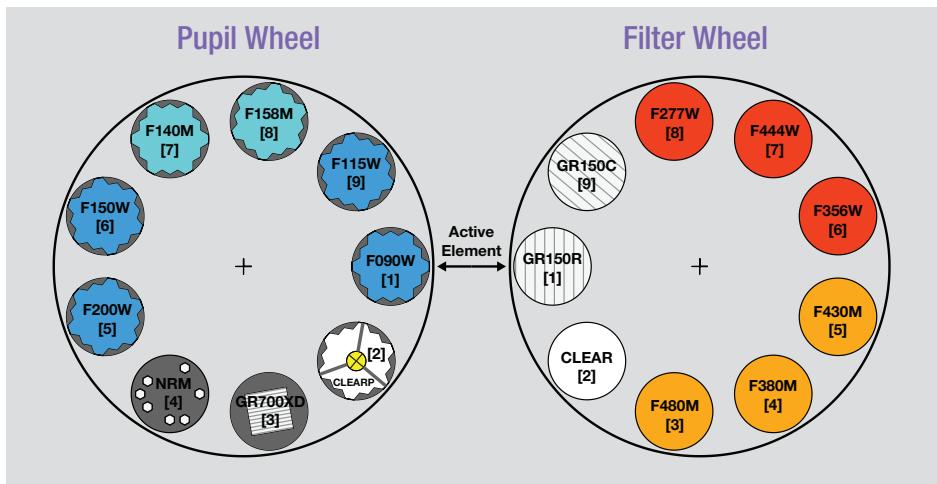




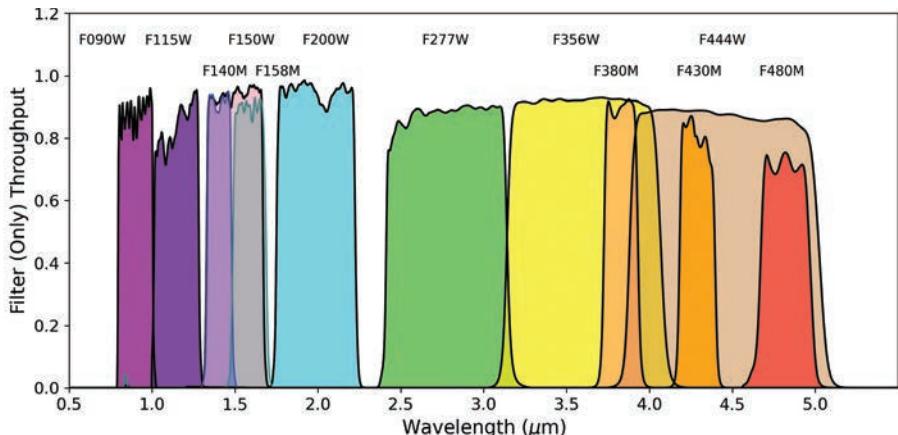
Near-Infrared Imager and Slitless Spectrograph (NIRISS)

Observing Modes			
Observing Mode	Wavelength Coverage (μm)	Field of View (arcsec)	Comments
Wide Field Slitless Spectroscopy (WFSS)	0.8 – 2.2	133 x 133	$R = 150$
Single Object Slitless Spectroscopy (SOSS)	0.6 – 2.8	~~~	$R = 700$
Aperture Masking Interferometry (AMI)	2.8 – 4.8	5.2 x 5.2	
Imaging	0.8 – 5.0	133 x 133	
Pixel Scale = 0.066''/pixel			

One Teledyne HgCdTe H2RG detector



Filter Transmission Profiles



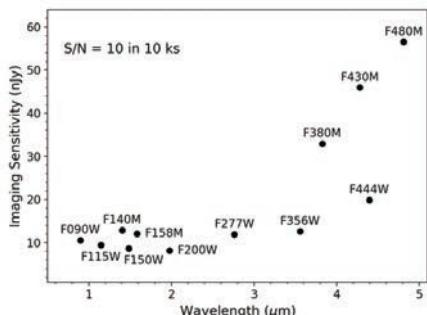


Imaging Bright Source Limits

Filter	Magnitude (Sirius)	Filter	Magnitude (Sirius)
F090W	18.5	F277W	15.7
F115W	18.3	F356W	14.8
F140M	17.1	F380M	12.8
F150W	17.7	F430M	12.1
F158M	16.8	F444W	13.9
F200W	16.9	F480M	11.8

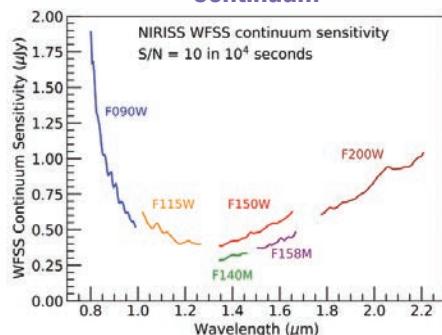
The magnitude in NIRISS filters is equivalent to the previous "Vegamag" system where the CALSPEC Sirius model from Bohlin 2022 is used as a template for an AOV star with a magnitude of -1.395 in all filters (Rieke et al. 2022).

Imaging Sensitivity

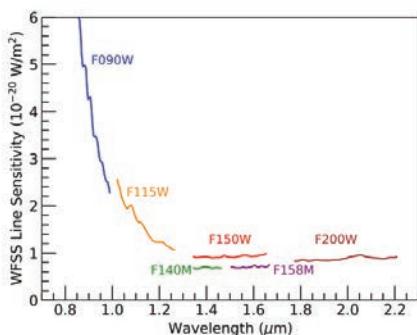


WFSS Sensitivity

Continuum



Line

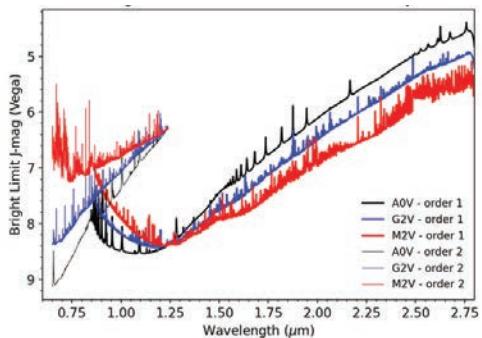


AMI Bright Source Limits*

Filter [†]	Magnitude (Sirius) Ngroups=1	Magnitude (Sirius) NGroups=2
F277W	6.8	7.6
F380M	3.9	4.7
F430M	3.3	4.0
F480M	2.9	3.7

*AMI bright limits are based on an accumulated signal limit of 30,000 e-, which corresponds to the approximate limit at which charge migration becomes measurable. The bright source limits in the table are for the SUB80 subarray; for full frame readout, the bright source limits are about 5.4 magnitudes fainter.

SOSS Bright Limits



Bright limits are based on NISRAPID readout with 1 integration and 2 groups with the SUBSTRIP256 subarray. Bright limits vary by Δ -mag = 0.7 for Full Frame readout and Δ -mag = -1.0 for SUBSTRIP96 readout (order 1 only).



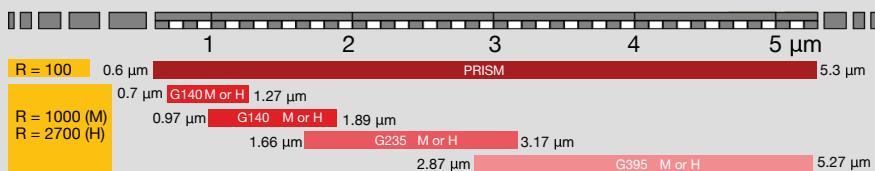
Near Infrared Spectrograph (NIRSpec)

Observing Modes	
Observing Mode	Field of View/ Aperture Size
Multi-Object Spectroscopy (MOS)	3.6' × 3.4', 0.20" × 0.46" shutters
Integral Field Unit (IFU) Spectroscopy	3.0" × 3.0", 0.1" × 0.1" spaxels
Fixed Slit (FS) Spectroscopy	0.2" × 3.2"
	0.4" × 3.65"
	1.6" × 1.6"
Bright Object Time Series (BOTS)	1.6" × 1.6"
Pixel Scale = 0.1 arcsec/pixel	

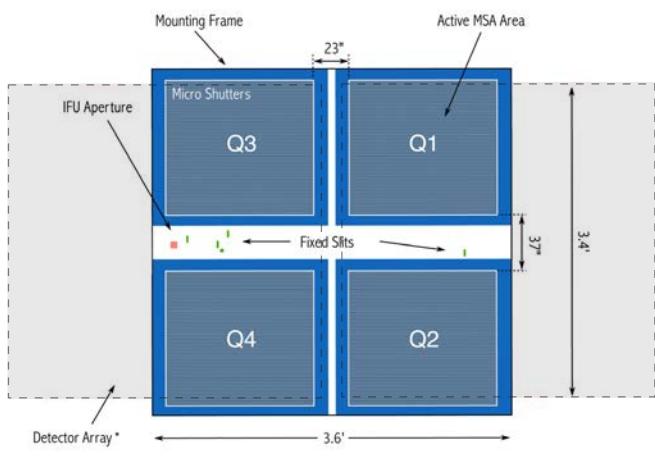
Disperser/Filter	T _{BB} = 10,000 K	T _{BB} = 2,500 K
	J Magnitude (Vega)	
PRISM/CLEAR	11.4	11.4
G140M/F070LP	9.2	9.1
G140M/F100LP	9.2	9.2
G235M/F170LP	8.0	9.2
G395M/F290LP	7.1	9.0
G140H/F070LP	8.1	8.0
G140H/F100LP	7.8	7.7
G235H/F170LP	6.7	7.8
G395H/F290LP	6.2	8.0

These values apply to the **S1600A1** aperture, used in the BOTS and FS modes. They were estimated with the ETC using a full well depth of 65,000 e-, readout mode **NRSRAPID**, two groups, and the smallest subarray with full wavelength coverage for each disperser/filter pair: **SUB512** for PRISM/CLEAR, and **SUB2048** for all others.

Wavelength Coverage

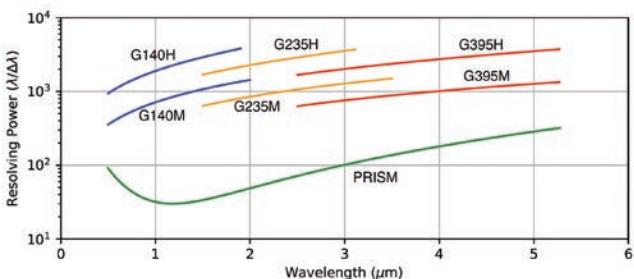


Field of View

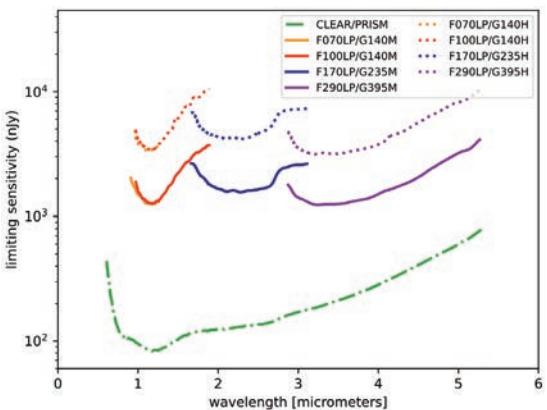


*Two Teledyne HgCdTe H2RG detectors, NRS1 and NRS2, separated by an ~18 arcsec gap

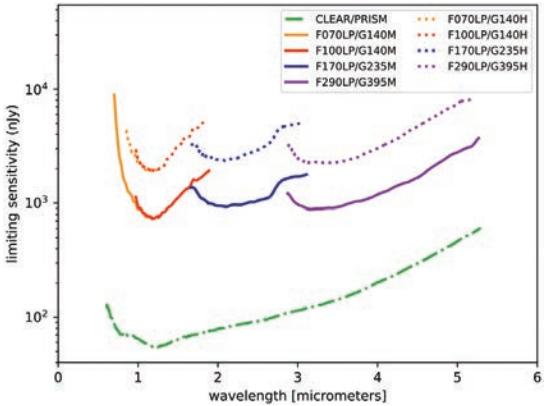
Resolving Power



IFU and MOS Sensitivity



IFU



MOS

The full frame FS mode sensitivities are similar to those of the MOS mode.

The continuum limiting sensitivity in IFU (upper) and MOS/FS (lower) mode is the flux required for a point source to reach S/N = 10 in ~10 ksec (10 exposures on-source of 70 groups and 1 integration using the **NRSIRS2RAPID** readout mode). The fluxes have been derived from on-orbit measurements.

The above IFU sensitivities were calculated using a 2-point **Nod-Off-Scene**.

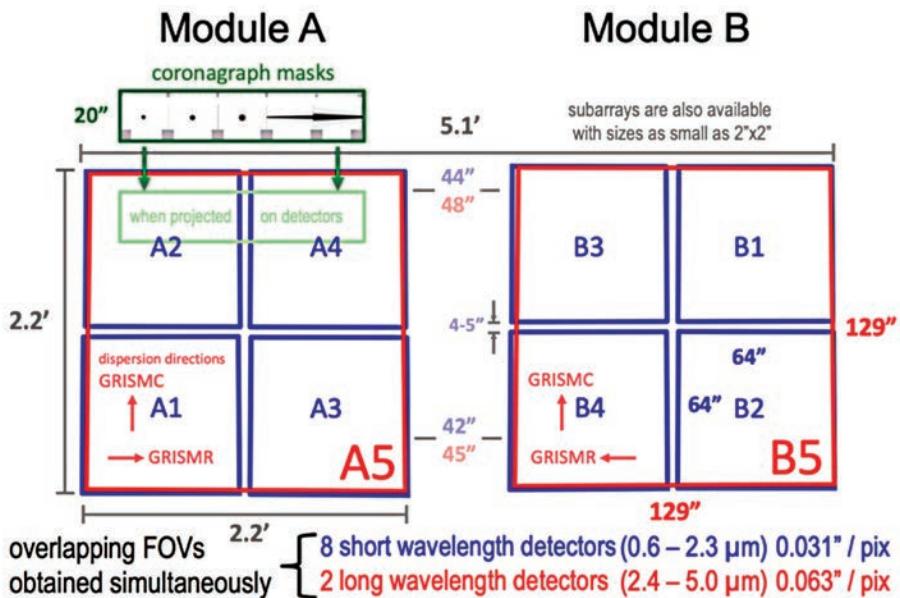


Near Infrared Camera (NIRCam)

Observing Modes				
Observing Mode	Wavelength Coverage (μm)	Field of View/Slit Size (arcsec)	Pixel Scale (arcsec/pixel)	Comment
Imaging	0.6-2.3, 2.4-5.0	2 x 132 x 132 with gaps, 2 x 129 x 129	0.031, 0.063	simultaneously using a dichroic
Coronagraphic Imaging	1.7 – 2.2, 2.4 – 5.0	20 x 20	0.031, 0.063	Inner Working Angle 0.14" – 0.89"
Wide Field Slitless Spectroscopy	2.4 – 5.0	2 x 129 x 129	0.063	$R = 1120 - 1680$
Time-Series Imaging	0.6 – 2.3, 2.4 – 5.0	64 x 64, 129 x 129	0.031, 0.063	weak lens available for bright sources
Grism Time Series	2.4 – 5.0	129 x 129	0.063	$R = 1120 - 1680$

10 Teledyne HgCdTe H2RG detectors: 8 short wavelength (SW; 0.6 – 2.3 μm) and 2 long wavelength (LW; 2.4 – 5.0 μm). All observations generate data in both wavelength channels. WFSS / grism TS observations generate SW imaging data.

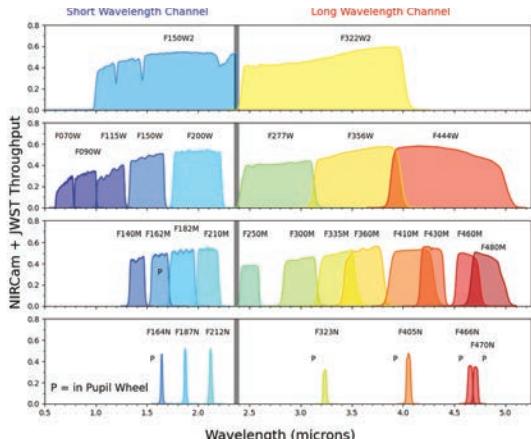
Field of View



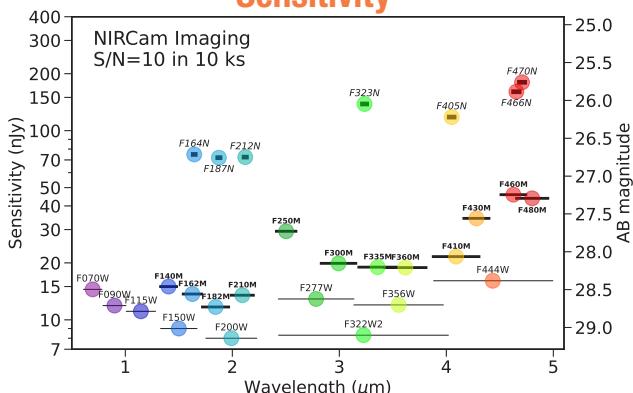
Near Infrared Camera (NIRCam)



Filter Transmission Profiles



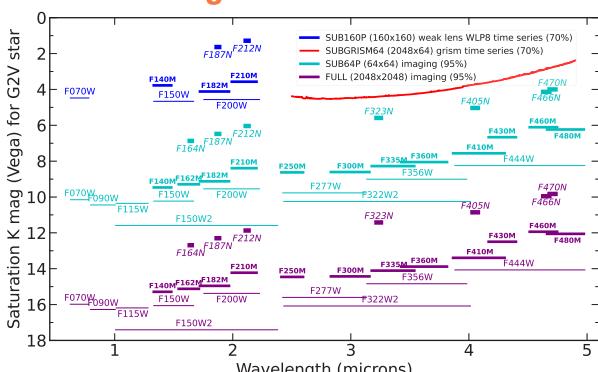
Sensitivity



Sensitivity estimates assume:

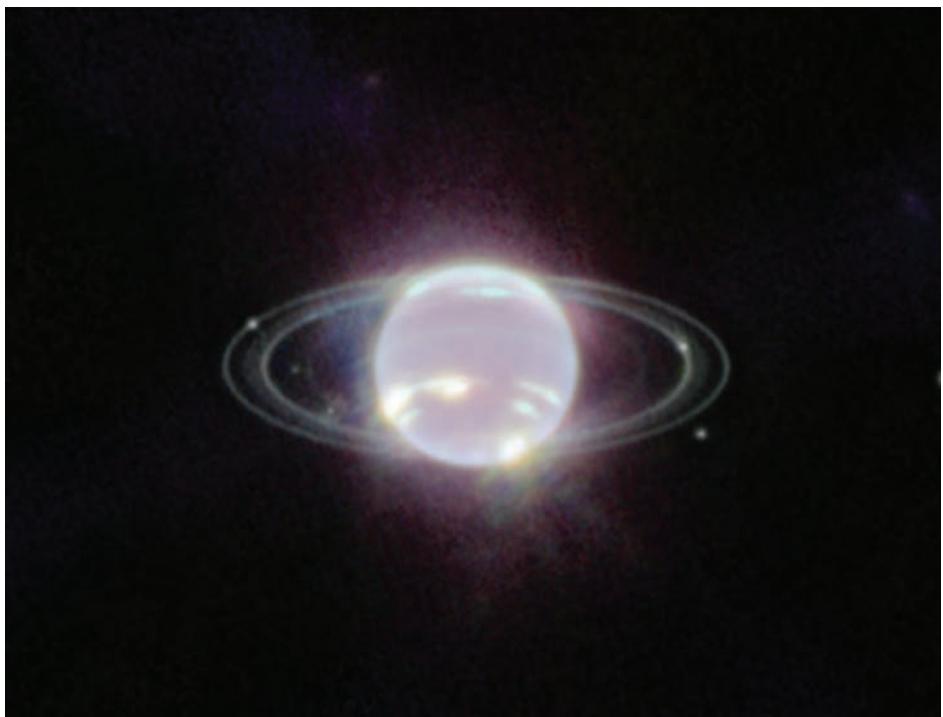
- 10 exposures of 10 groups of MEDIUM8
- $r=0.08''$ aperture for short wavelength
- $r=0.16''$ aperture for long wavelength
- large annuli for background subtraction

Bright Source Limits



Bright Source Limits assume:

- two detector reads (two groups of RAPID)
- 70% pixel well capacity for time series
- 95% pixel well capacity for imaging

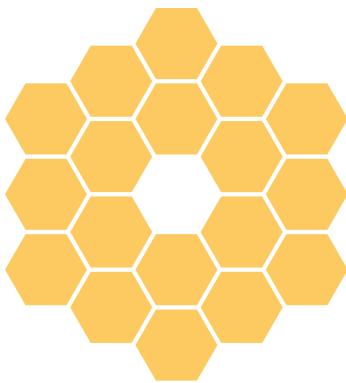


JWST's Near-Infrared Camera (NIRCam) image of Neptune, taken on July 12, 2022, using filters F140M, F210M, F300M, F460M

Credits: Image: NASA, ESA, CSA, STScI; Image Processing: Joseph DePasquale (STScI), Naomi Rowe-Gurney (NASA-GSFC)

More information at:

- JWST Science website — jwst.stsci.edu
- JWST Documentation — jwst-docs.stsci.edu
- JWST Exposure Time Calculator — jwst.etc.stsci.edu
- JWST Astronomer's Proposal Tool — apt.stsci.edu
- JWST Interactive Sensitivity Tool — jist.stsci.edu
- JWST Help Desk — jwsthlp.stsci.edu
- JWST Video Tutorial Help — www.youtube.com/jwstobserver
- JWST Data Analysis Resources — jdat.stsci.edu
- JWST Outreach Resources — webbtelescope.org
- For updates and announcements on JWST science, follow **@JWSTObserver** on **twitter** and **facebook**.



Cover: Pillars of Creation

Front: NIRCam, Filters: F090W, F187N, F200W, F335M, F444W, F470N

Back: MIRI, Filters: F770W, F1130W, F1500W

Cover graphic credit:

Science: NASA, ESA, CSA, STScI

Image Processing: Joseph DePasquale (STScI), Anton M. Koekemoer (STScI), Karl Gordon (STScI), Alyssa Pagan (STScI)

JWST Field of View

