

# JWST

## Pocket Guide

January 2020



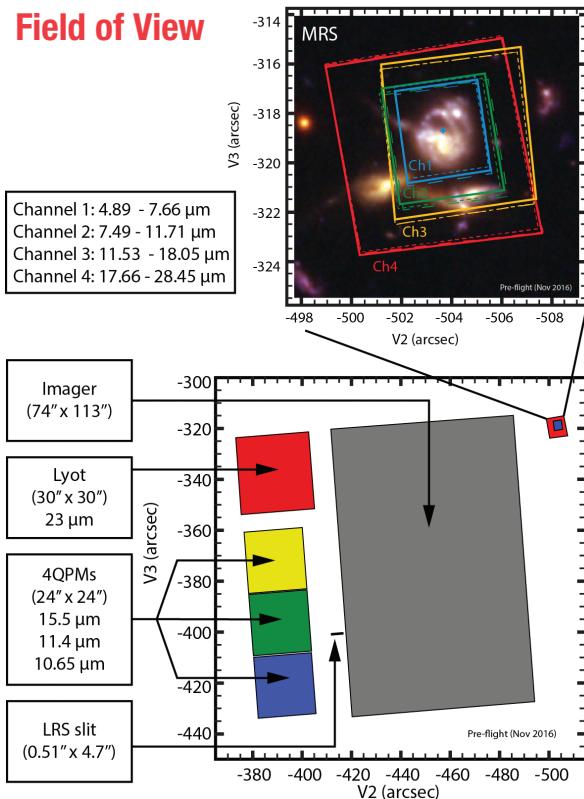
STScI



Observing Modes				
Observing Mode	Wavelength Coverage ( $\mu\text{m}$ )	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	
Lyot Coronagraphic Imaging	23	30 x 30	0.11	
Low Resolution Spectroscopy (LRS)	5-12	0.51 x 4.7 (slit)	0.11	Single Object Slitless Mode Available $R \sim 100$
Medium Resolution Spectroscopy (MRS)	4.9-28.8	3.9 to 7.7 (IFU)	0.196 - 0.273	$R \sim 2,500$

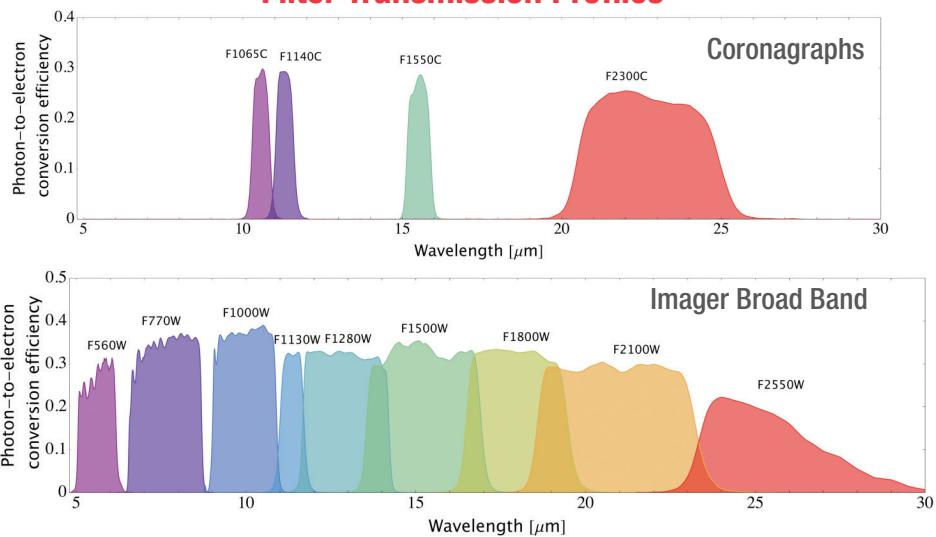
Imager contains one and MRS contains two Raytheon SiAs impurity band conduction (IBC) detectors

## Field of View





## Filter Transmission Profiles



### Bright Source Limits\*

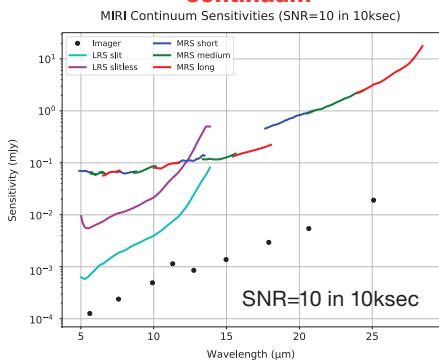
Filter	Flux Density
F560W	4.0 mJy
F770W	3.5 mJy
F1000W	7.8 mJy
F1130W	33 mJy
F1280W	13 mJy
F1500W	17 mJy
F1800W	32 mJy
F2100W	32 mJy
F2550W	95 mJy
MRS Channel 1	4.1 Jy
MRS Channel 2	4.4 Jy
MRS Channel 3	8.4 Jy
MRS Channel 4	37 Jy
LRS Slit (at 7.5 $\mu\text{m}$ )	100 mJy
LRS Slitless (at 7.5 $\mu\text{m}$ )	1,326 mJy

\* Brightness limit set at 70% full-well capacity for full array, NGROUPS = 5.

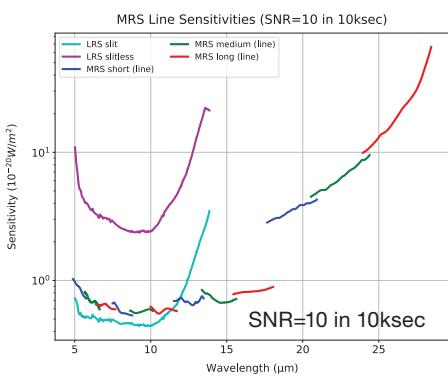
**Subarrays for brighter sources available.**

Limits are for continuum point sources.

### Sensitivities Continuum



### Line

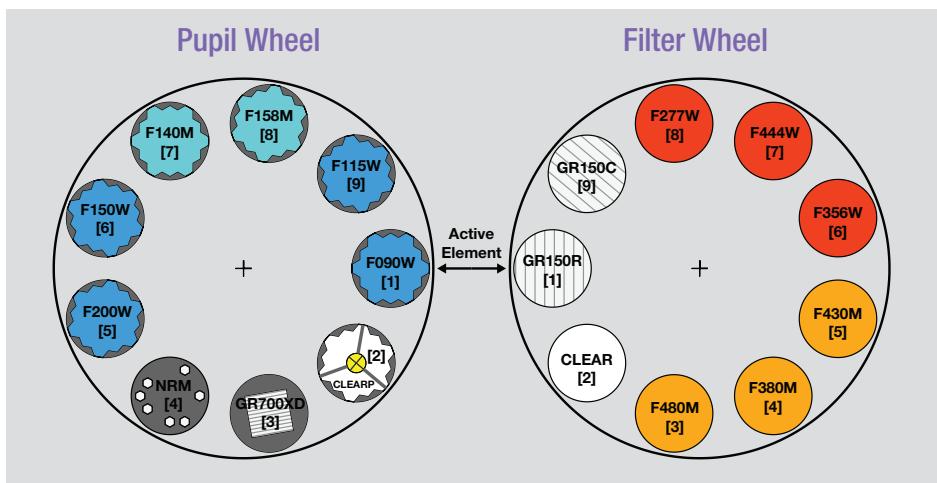




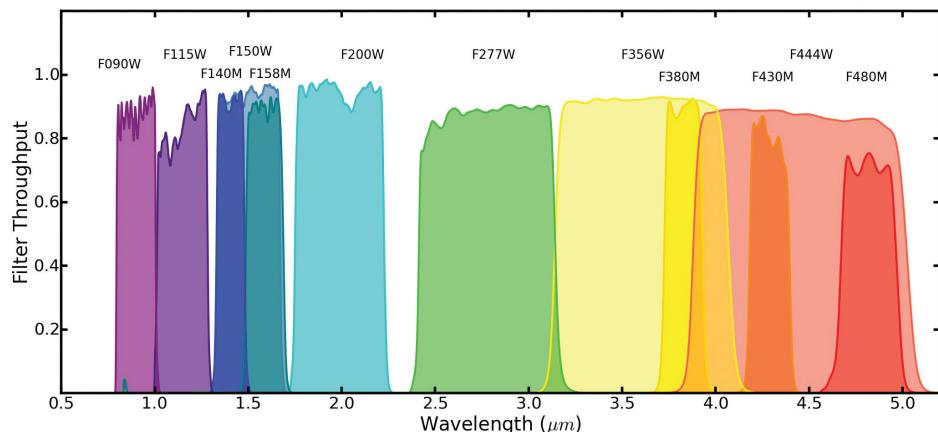
# Near-Infrared Imager and Slitless Spectrograph (NIRISS)

Observing Modes		
Observing Mode	Wavelength Coverage ( $\mu\text{m}$ )	Field of View/Slit Size (arcsec)
Wide Field Slitless Spectroscopy (WFSS)	0.8-2.2	133 x 133
Single Object Slitless Spectroscopy (SOSS)	0.6-2.8	~~~
Aperture Masking Interferometry (AMI)	2.8-4.8	5.2 x 5.2
Imaging	0.8-5.0	133 x 133
Pixel Scale = 0.065''/pixel		

One Teledyne HgCdTe H2RG detector



## Filter Transmission Profiles



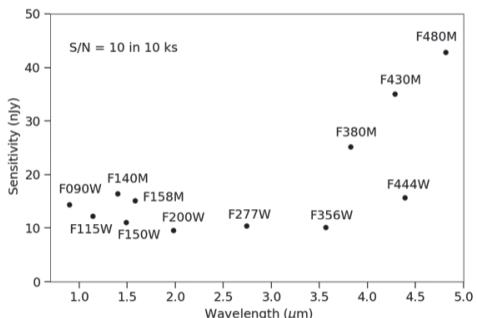
# Near-Infrared Imager and Slitless Spectrograph (NIRISS)



## Imaging Bright Source Limits

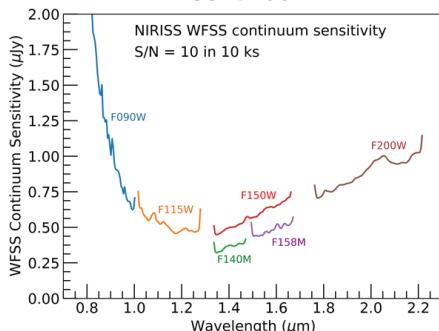
Filter	Magnitude (Vega)	Filter	Magnitude (Vega)
F090W	17.46	F277W	15.57
F115W	17.61	F356W	14.71
F140M	16.51	F380M	12.69
F150W	17.21	F430M	12.03
F158M	16.36	F444W	13.80
F200W	16.69	F480M	11.68

## Imaging Sensitivity

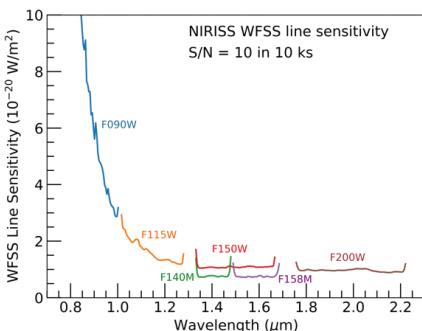


## WFSS Sensitivity

### Continuum



### Line



## AMI/SOSS Bright Source Limits

Mode	Filter	Readout	Magnitude (Vega)
AMI	F277W	80 x 80 subarray, Ngroups=1	7.0
AMI	F380M	80 x 80 subarray, Ngroups=1	4.1
AMI	F430M	80 x 80 subarray, Ngroups=1	3.4
AMI	F480M	80 x 80 subarray, Ngroups=1	3.1
AMI	F277W	80 x 80 subarray, Ngroups=2	7.6
AMI	F380M	80 x 80 subarray, Ngroups=2	4.7
AMI	F430M	80 x 80 subarray, Ngroups=2	4.0
AMI	F480M	80 x 80 subarray, Ngroups=2	3.7
SOSS	J	256 x 2048 subarray, Order 1, Ngroups=2	8.5
SOSS	J	256 x 2048 subarray, Order 2, Ngroups=2	7.2
SOSS	J	96 x 2048 subarray, Order 1, Ngroups=2	7.5



# Near Infrared Spectrograph (NIRSpec)

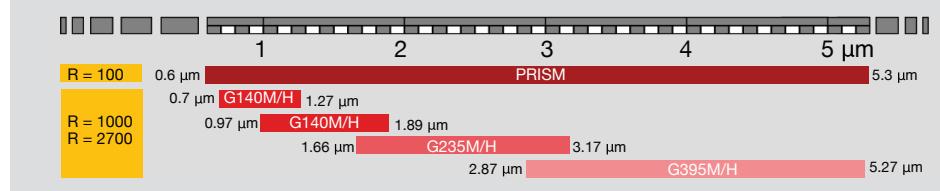
Observing Modes		
Observing Mode	Field of View/ Slit Size (arcsec)	Pixel Scale (arcsec/pixel)
Multi-Object Spectroscopy	0.2 x 0.46 (individual shutter)	0.1
IFU Spectroscopy	3.0 x 3.0	0.1
Fixed Slit Spectroscopy	0.2 x 3.2, 0.4 x 3.65, 1.6 x 1.6	0.1
Bright Object Time Series	1.6 x 1.6	0.1

Disperser/Filter	$T_{\text{eff}} = 10,000 \text{ K}$	$T_{\text{eff}} = 2,500 \text{ K}$
	J Magnitude (Vega)	
PRISM/CLEAR	10.2	10.2
G140M/F070LP	8.2	8.2
G140M/F100LP	8.2	8.2
G235M/F170LP	7.0	7.8
G395M/F290LP	6.2	7.4
G140H/F070LP	7.1	7.0
G140H/F100LP	7.1	7.0
G235H/F170LP	5.9	6.7
G395H/F290LP	5.1	6.2

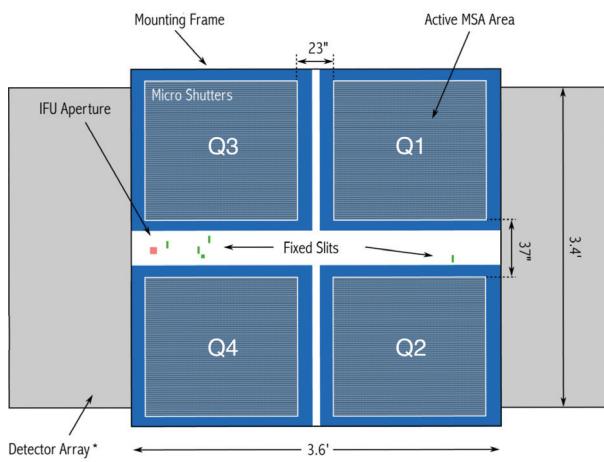
\*These values apply to the S1600A1 aperture, used in the BOTS and FS modes. They were determined using a conservative full well depth of 65,000 e<sup>-</sup>, and the smallest subarray with full wavelength coverage for each disperser/filter pair: SUB512 for PRISM/CLEAR, and SUB2048 for all others.

Two Teledyne HgCdTe H2RG detectors

## Wavelength Coverage

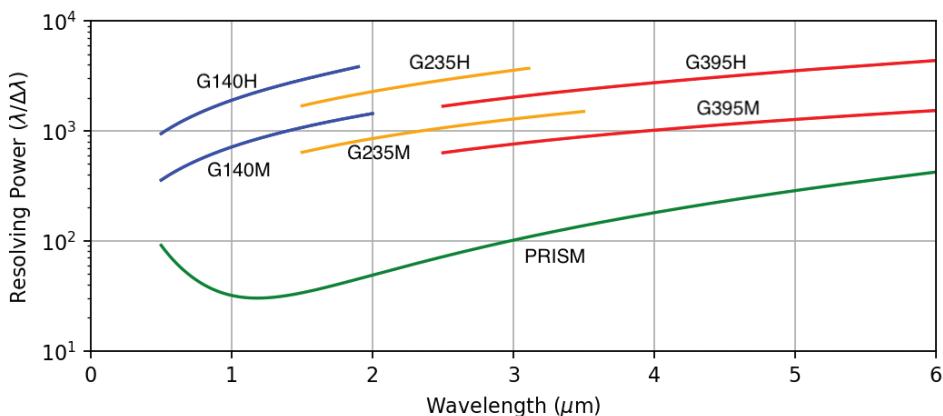


## Field of View

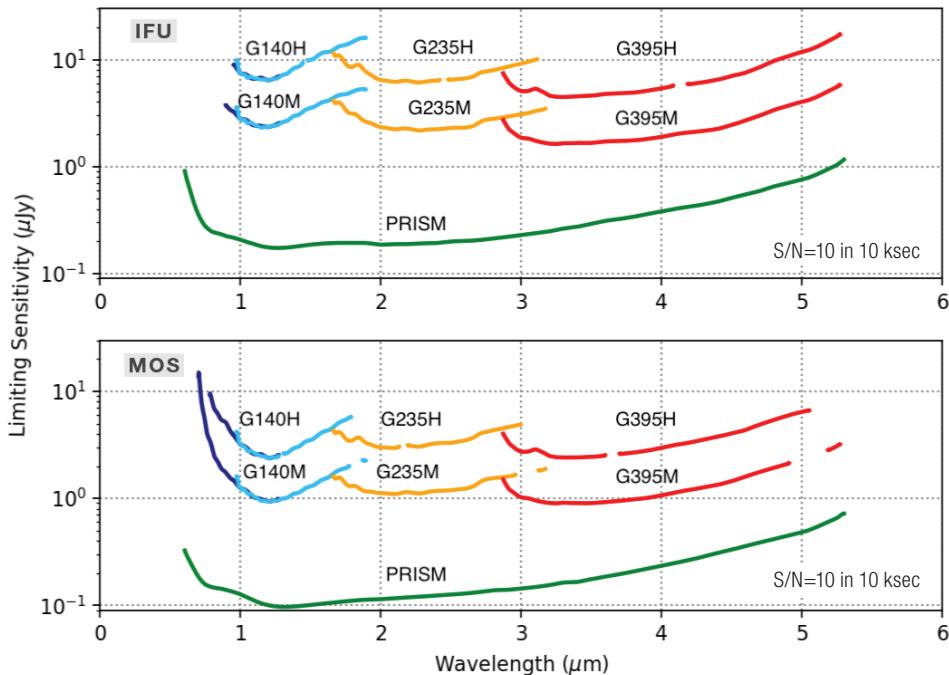


\*Two detectors, separated by a 18 arcsecond gap.

## Resolving Power



## IFU and MOS Sensitivity



The limiting sensitivity is the flux required for a point source to reach  $S/N = 10$  in ten 963 sec exposures (13 groups and 1 integration each using the **NRSIRS2** readout mode). The five colors represent the wavelength coverage of the five filters, two of which are paired with **G140M/H**. Note that cutoffs and gaps appear where spectra fall off the detector edge or into the detector gap. For IFU mode, these are at fixed wavelengths for each disperser and slice, but for MOS mode, the wavelengths lost will depend on the location of a source's MSA shutter.



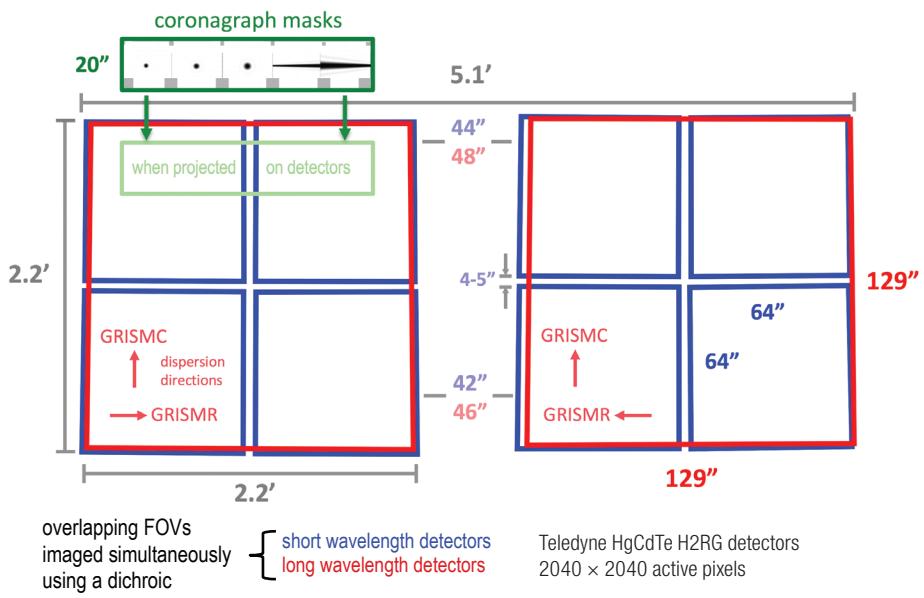
## Observing Modes

Observing Mode	Wavelength Coverage ( $\mu\text{m}$ )	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	IWA 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	132 x 132 with gaps 129 x 129	0.031, 0.063	weak lens available
Grism Time Series	2.4-5.0	129 x 129	0.063	R = 1120 – 1680

## Field of View

### Module A

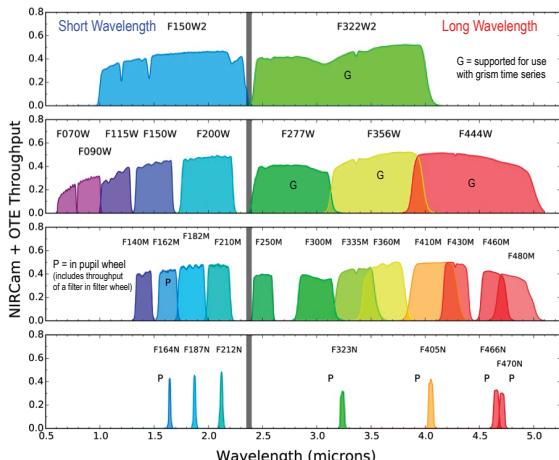
### Module B



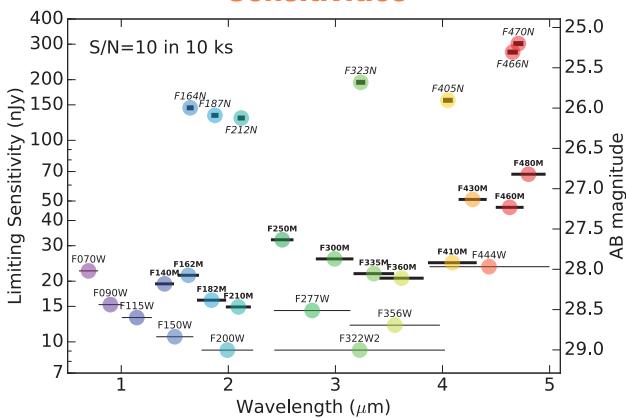
# Near Infrared Camera (NIRCam)



## Filter Transmission Profiles



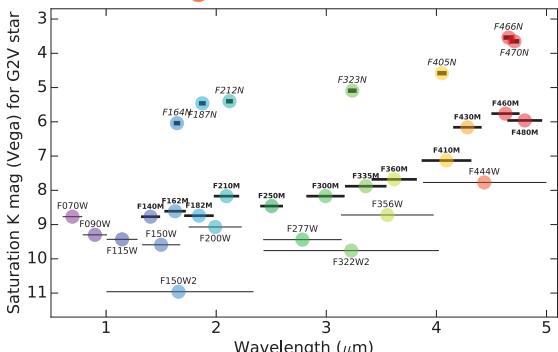
## Sensitivities



**Sensitivity estimates assume:**

- 10 exposures of 10 groups of MEDIUM8
- low zodi (Ultra Deep Field in November)
- $r=0.08''$  aperture for short wavelength
- $r=0.16''$  aperture for long wavelength
- large annuli for background subtraction

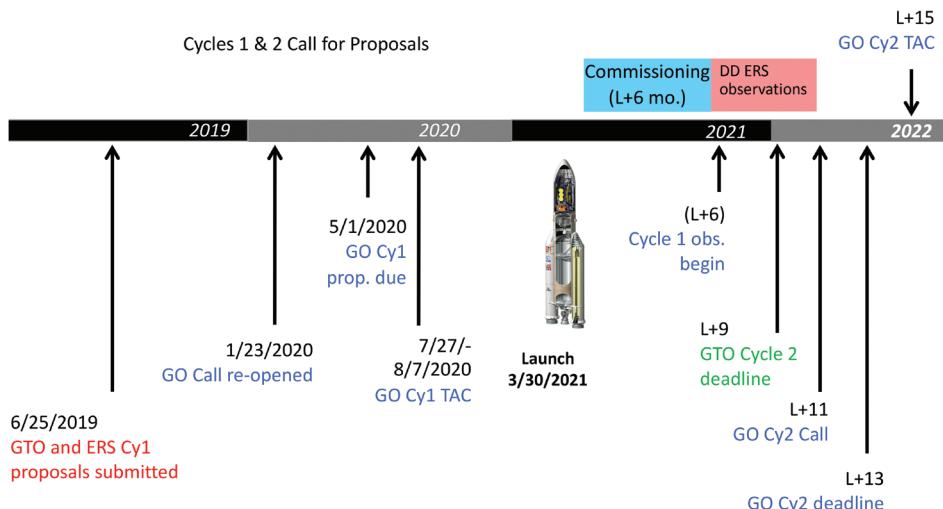
## Bright Source Limits



**Bright Source Limits assume:**

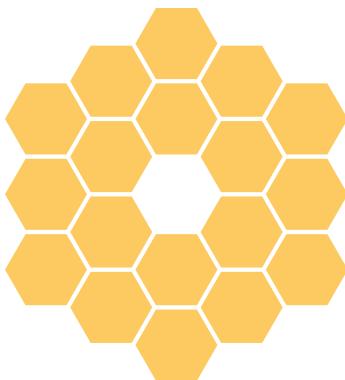
- 95% pixel well capacity
- two reads of 64x64 subarray (~0.1 s)
- objects brighter than those plotted may be observed without saturation using the weak lens or grism

# JWST Science Planning Timeline



More information at:

- JWST science website — [jwst.stsci.edu](http://jwst.stsci.edu)
- JWST documentation — [jwst-docs.stsci.edu](http://jwst-docs.stsci.edu)
- JWST Exposure Time Calculator — [jwst.etc.stsci.edu](http://jwst.etc.stsci.edu)
- JWST Astronomer's Proposal Tool — [apt.stsci.edu](http://apt.stsci.edu)
- JWST Help Desk — [jwsthelp.stsci.edu](http://jwsthelp.stsci.edu)
- JWST Video Tutorial Help — [www.youtube.com/jwstobserver](http://www.youtube.com/jwstobserver)
- JWST milestone status and recent accomplishments  
— [jwst.nasa.gov/recentaccomplish.html](http://jwst.nasa.gov/recentaccomplish.html)
- For updates and announcements on JWST science,  
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**Cover: M31 at infrared and visible wavelengths with Spitzer (8.0  $\mu$ m) and Hubble (0.475 and 0.814  $\mu$ m)**

**Cover graphic credit:** NASA/JPL-Caltech/D. Block (Anglo American Cosmic Dust Lab, SA); NASA, ESA, J. Dalcanton, B.F. Williams, L.C. Johnson (University of Washington), the PHAT team, and R. Gendler

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## JWST Field of View

