



2362 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at $z \sim 5$

Cycle: 1, Proposal Category: GO

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1	27397 - FS	NIRSpec Fixed Slit Spectroscopy	(1) 27397
	101	27397 - FS	NIRSpec Fixed Slit Spectroscopy	(1) 27397
	4	27397 - Imaging	NIRCam Imaging	(1) 27397
	104	27397 - Imaging	NIRCam Imaging	(1) 27397
	2	130302 - FS	NIRSpec Fixed Slit Spectroscopy	(2) 130302
	5	130302 - Imaging	NIRCam Imaging	(2) 130302
	105	130302 - Imaging	NIRCam Imaging	(2) 130302
	3	61265 - FS	NIRSpec Fixed Slit Spectroscopy	(3) 61265
	6	61265 - Imaging	NIRCam Imaging	(3) 61265
	106	61265 - Imaging	NIRCam Imaging	(3) 61265

ABSTRACT

Over the last twenty years increasingly deeper and wider near-infrared photometric surveys have identified evolved massive galaxies at continually higher redshifts. These rapidly-forming and quenching galaxies create significant tension with cosmological models of galaxy formation and highly constrain the implementation of AGN feedback physics. Using UltraVISTA/COSMOS, the deepest and widest-field near-IR survey to date we have identified three galaxies with $\text{Log}(M/M_{\text{sun}}) > 11.5$ at $z \sim 5$ with robust photometric redshifts. We propose deep medium-resolution NIRSpec spectroscopy in G235M/F170LP and G395M/F290LP, to target multiple prominent rest-frame optical absorption/emission lines, as well as NIRCam F444W and F200W imaging to determine morphologies. These data will be used to: 1) Confirm the redshifts and stellar masses of these extreme objects during the epoch when they form most of their stellar mass, 2) measure the star-formation rates, star-formation histories and mass distributions of these galaxies to constrain their assembly history, and 3) determine the source of ionization radiation and determine if they contain prominent AGN. The long-wavelength capability of JWST means this will be the first rest-frame optical study of massive galaxies during their peak formation epoch and will return key information on how such galaxies form so fast, so early. One of our candidates has an SED consistent with being a fully quenched and passive galaxy at $z \sim 5$. If confirmed, this will be by far the highest-redshift passive galaxy to date, and will have significant implications for AGN quenching models.

OBSERVING DESCRIPTION

JWST Proposal 2362 (Created: Friday, April 28, 2023 at 5:01:36 PM Eastern Standard Time) - Overview

The observations proposed for in this program are NIRSpec FS spectroscopy and NIRCам imaging data for 3 very massive ($M > 10^{11.5} M_{\text{sol}}$) galaxies identified at $z \sim 5$.

We will observe each target with two NIRSpec grating/filter combinations, G235M/F170LP and G395M/290LP, targeting the rest-frame optical wavelengths at the redshifts of targets. The exposure times and grating/filter choices of NIRSpec observations are chosen to pick out multiple emission features (e.g., OII, OIII, Balmer features), as well as to probe the stellar continuum of targets (especially D4000/Balmer breaks) to sufficient depth in order to decipher and constrain stellar population properties.

The requested time with NIRSpec for all three targets is 6.1 hours, ~ 2.6 hrs of which is devoted to science exposures.

With NIRCам, we will obtain simultaneous F200W and F444W imaging for each target. These will provide spatially resolved information regarding the size and morphologies of the proposed targets at rest-frame U and i bands. The exposure times for NIRCам imaging of each target are set to provide $\text{SNR} > \sim 100$, the minimum required to accurately model 2D light profiles.

The requested time with NIRCам for all three targets is 2.5 hours, with ~ 40 mins devoted to science exposures.

The total charged time requested is 8.58 hrs, 3.30 hrs of which is devoted to science exposures (5.28 hours of overheads).

Proposal 2362 - Targets - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	27397	RA: 09 58 53.7696 (149.7240400d) Dec: +01 37 46.53 (1.62959d) Equinox: J2000		
<i>Comments:</i> Category=Galaxy Description=[Field galaxies, High-redshift galaxies] Extended=NO				
(2)	130302	RA: 10 01 40.2456 (150.4176900d) Dec: +02 28 58.23 (2.48284d) Equinox: J2000		
<i>Comments:</i> Category=Galaxy Description=[Field galaxies, High-redshift galaxies] Extended=NO				
(3)	61265	RA: 10 02 1.0368 (150.5043200d) Dec: +02 13 34.99 (2.22639d) Equinox: J2000		
<i>Comments:</i> Category=Galaxy Description=[Field galaxies, High-redshift galaxies] Extended=NO				

Fixed Targets

Proposal 2362 - Observation 1 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

Fri Apr 28 22:01:36 GMT 2023

Observation	Proposal 2362, Observation 1: 27397 - FS Diagnostic Status: Warning Observing Template: NIRSpec Fixed Slit Spectroscopy											
	(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)	27397	RA: 09 58 53.7696 (149.7240400d) Dec: +01 37 46.53 (1.62959d) Equinox: J2000									
<i>Comments:</i> Category=Galaxy Description=[Field galaxies, High-redshift galaxies] Extended=NO												
Acquisition	#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	SAME	WATA	FULL	F140X	NRSRAPIDD6	3	1	1	171.788	63615.70	
Template	Slit					Subarray						
	S400A1					FULL						
Dithers	#	Primary Dither Positions					Sub-Pixel Pattern					
	1	3					NONE					
Spectral Elements	#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Ex #	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	G235M/F170LP	S400A1	NRSIRS2RAPID	45	1	1	NONE	3	3	2013.267	63615.60
	2	G395M/F290LP	S400A1	NRSIRS2RAPID	26	1	2	NONE	3	3	1181.7	63615.61

Proposal 2362 - Observation 101 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

Fri Apr 28 22:01:36 GMT 2023

Observation	Proposal 2362, Observation 101: 27397 - FS Diagnostic Status: Warning Observing Template: NIRSpec Fixed Slit Spectroscopy											
	(Visit 101:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(1)	27397	RA: 09 58 53.7696 (149.7240400d) Dec: +01 37 46.53 (1.62959d) Equinox: J2000									
<i>Comments:</i> Category=Galaxy Description=[Field galaxies, High-redshift galaxies] Extended=NO												
Acquisition	#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	SAME	WATA	FULL	F140X	NRSRAPIDD6	3	1	1	171.788	63615.70	
Template	Slit					Subarray						
	S400A1					FULL						
Dithers	#	Primary Dither Positions					Sub-Pixel Pattern					
	1	3					NONE					
Spectral Elements	#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Ex #	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	G235M/F170LP	S400A1	NRSIRS2RAPID	45	1	1	NONE	3	3	2013.267	63615.60
	2	G395M/F290LP	S400A1	NRSIRS2RAPID	26	1	2	NONE	3	3	1181.7	63615.61

Proposal 2362 - Observation 4 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

Fri Apr 28 22:01:36 GMT 2023

Observation	<p>Proposal 2362, Observation 4: 27397 - Imaging</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>									
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		
	(1)	27397	RA: 09 58 53.7696 (149.7240400d) Dec: +01 37 46.53 (1.62959d) Equinox: J2000							
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Field galaxies, High-redshift galaxies]</i> <i>Extended=NO</i></p>									
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	SMALL-GRID-DITHER			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	F200W	F444W	BRIGHT2	9	1	4	4	773.047	63615.64
Special Requirements	<p>Offset -55.0 arcsec, 33.0 arcsec</p> <p>Background Limited. Background no more than 40th percentile above minimum</p>									

Proposal 2362 - Observation 104 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

Fri Apr 28 22:01:36 GMT 2023

Observation	<p>Proposal 2362, Observation 104: 27397 - Imaging</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>									
Diagnostics	(Visit 104:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections			Miscellaneous		
	(1)	27397	RA: 09 58 53.7696 (149.7240400d) Dec: +01 37 46.53 (1.62959d) Equinox: J2000							
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Field galaxies, High-redshift galaxies]</i> <i>Extended=NO</i></p>									
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	SMALL-GRID-DITHER			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	F200W	F444W	BRIGHT2	9	1	4	4	773.047	63615.64
Special Requirements	<p>Offset -55.0 arcsec, 33.0 arcsec</p> <p>Background Limited. Background no more than 40th percentile above minimum</p>									

Proposal 2362 - Observation 2 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

Fri Apr 28 22:01:36 GMT 2023

Observation	Proposal 2362, Observation 2: 130302 - FS Diagnostic Status: Warning Observing Template: NIRSpec Fixed Slit Spectroscopy											
	(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)	130302	RA: 10 01 40.2456 (150.4176900d) Dec: +02 28 58.23 (2.48284d) Equinox: J2000									
<i>Comments:</i> Category=Galaxy Description=[Field galaxies, High-redshift galaxies] Extended=NO												
Acquisition	#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	SAME	WATA	FULL	F140X	NRSRAPIDD6	3	1	1	171.788	63615.73	
Template	Slit				Subarray							
	S400A1				FULL							
Dithers	#	Primary Dither Positions					Sub-Pixel Pattern					
	1	3					NONE					
Spectral Elements	#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Ex #	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	G235M/F170LP	S400A1	NRSIRS2RAPID	55	1	1	NONE	3	3	2450.934	63615.59
	2	G395M/F290LP	S400A1	NRSIRS2RAPID	26	1	2	NONE	3	3	1181.7	63615.62

Proposal 2362 - Observation 5 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

Fri Apr 28 22:01:36 GMT 2023

Observation	<p>Proposal 2362, Observation 5: 130302 - Imaging</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>									
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		
	(2)	130302	RA: 10 01 40.2456 (150.4176900d) Dec: +02 28 58.23 (2.48284d) Equinox: J2000							
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Field galaxies, High-redshift galaxies]</i> <i>Extended=NO</i></p>									
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	SMALL-GRID-DITHER			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	F200W	F444W	BRIGHT2	9	1	4	4	773.047	63616.65
Special Requirements	<p>Offset -55.0 arcsec, 33.0 arcsec</p> <p>Background Limited. Background no more than 40th percentile above minimum</p>									

Proposal 2362 - Observation 105 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

Fri Apr 28 22:01:36 GMT 2023

Observation	<p>Proposal 2362, Observation 105: 130302 - Imaging</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>									
Diagnostics	(Visit 105:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections			Miscellaneous		
	(2)	130302	RA: 10 01 40.2456 (150.4176900d) Dec: +02 28 58.23 (2.48284d) Equinox: J2000							
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Field galaxies, High-redshift galaxies]</i> <i>Extended=NO</i></p>									
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	SMALL-GRID-DITHER			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	F200W	F444W	BRIGHT2	9	1	4	4	773.047	63616.65
Special Requirements	<p>Offset 38.0 arcsec, 42.0 arcsec</p> <p>Background Limited. Background no more than 40th percentile above minimum</p>									

Proposal 2362 - Observation 3 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

Fri Apr 28 22:01:36 GMT 2023

Observation	<p>Proposal 2362, Observation 3: 61265 - FS</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec Fixed Slit Spectroscopy</p>											
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)	61265	RA: 10 02 1.0368 (150.5043200d) Dec: +02 13 34.99 (2.22639d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Field galaxies, High-redshift galaxies]</i> <i>Extended=NO</i></p>											
Acquisition	#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	SAME	WATA	FULL	F140X	NRSRAPIDD6	3	1	1	171.788	63615.75	
Template	Slit				Subarray							
	S400A1				FULL							
Dithers	#	Primary Dither Positions					Sub-Pixel Pattern					
	1	3					NONE					
Spectral Elements	#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Ex #	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	G235M/F170LP	S400A1	NRSIRS2RAPID	40	1	1	NONE	3	3	1794.433	63615.48
	2	G395M/F290LP	S400A1	NRSIRS2RAPID	26	1	2	NONE	3	3	1181.7	63615.63

Proposal 2362 - Observation 6 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

Fri Apr 28 22:01:36 GMT 2023

Observation	<p>Proposal 2362, Observation 6: 61265 - Imaging</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>									
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		
	(3)	61265	RA: 10 02 1.0368 (150.5043200d) Dec: +02 13 34.99 (2.22639d) Equinox: J2000							
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Field galaxies, High-redshift galaxies]</i> <i>Extended=NO</i></p>									
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	SMALL-GRID-DITHER			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	F200W	F444W	BRIGHT2	9	1	4	4	773.047	63615.66
Special Requirements	<p>Offset -55.0 arcsec, 33.0 arcsec</p> <p>Background Limited. Background no more than 40th percentile above minimum</p>									

Proposal 2362 - Observation 106 - Dawn of the Monsters: JWST Characterization of Extremely Massive Galaxies at z~5

Fri Apr 28 22:01:36 GMT 2023

Observation	<p>Proposal 2362, Observation 106: 61265 - Imaging</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>									
Diagnostics	(Visit 106:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections			Miscellaneous		
	(3)	61265	RA: 10 02 1.0368 (150.5043200d) Dec: +02 13 34.99 (2.22639d) Equinox: J2000							
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Field galaxies, High-redshift galaxies]</i> <i>Extended=NO</i></p>									
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	SMALL-GRID-DITHER			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	F200W	F444W	BRIGHT2	9	1	4	4	773.047	63615.66
Special Requirements	<p>Offset -55.0 arcsec, 33.0 arcsec</p> <p>Background Limited. Background no more than 40th percentile above minimum</p>									