



2566 - Characterizing Stellar Mass Assembly and Physical Properties in the Brightest Galaxy in the Redshift>5 Universe

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>
NIRSPEC IFU Spectroscopy				
	1		NIRSpec IFU Spectroscopy	(6) Group J1241+2219
NIRCAM Imaging				
	4		NIRCam Imaging	(2) J1241+2219-B

ABSTRACT

We propose for spectroscopy and imaging of COOL J1241+2219, a recently discovered lensed galaxy at $z=5.043$ that at $H_{AB}=20.5$ is the brightest galaxy (at OIR wavelengths) known at $z \geq 5$. COOL J1241+2219 is 5x brighter than the prior record-holder at these redshifts, and as such it has become the target of extensive follow-up observations, both from space- and ground-based observatories. This galaxy is at a redshift that allows NIRSpec IFU observations that in two grating settings span the entire suite of classical diagnostic emission lines at $R \sim 1000$. That spectroscopy, and complementary NIRCam imaging, will allow measurement a host of properties in this galaxy, and due to lensing at spatial scales of ~ 100 pc! Specifically we will measure the morphology and internal structure, dynamics, metallicities, physical conditions of the nebular gas and powering hot stars, and the star formation history back into and through the epoch of reionization. We will do this both for the galaxy as a whole at exquisite signal levels, to connect this galaxy to broader extant knowledge of the $z \sim 5$ universe, and patch-by-patch at ~ 100 pc scales. A key and defining aspect of these observations will be the measurement of "direct" metallicities, establishing a critical benchmark for many other expected JWST studies. This modest investment of time with an extraordinary observatory observing an extraordinary object will establish a key observational reference at an epoch immediately following reionization, where our detailed knowledge of galaxies is still remarkably limited.

OBSERVING DESCRIPTION

We propose NIRCam imaging and NIRSpec IFU spectroscopy for COOL J2241+2219 ($z=5.043$, $H_{ABmag}=20.5$). We request imaging in the F115W, F150W, F200W, F250M, F335M, and F460M filters, with SHALLOW4 readout, and a 4-1-4 (groups-integration-exposure) on a 4-point dither strategy. We request IFU spectroscopy with the F235M and F395M gratings, with a NRSIRS2 readout, and a 16-1-4 (groups-integration-exposure) and 4-pointings + 1 off-source pointing strategy.

Proposal 2566 - Targets - Characterizing Stellar Mass Assembly and Physical Properties in the Brightest Galaxy in the Redshift>5 Uni...

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	J1241+2219-A	RA: 12 41 29.8890 (190.3745375d) Dec: +22 19 41.50 (22.32819d) Equinox: J2000	Epoch of Position: 2000	
	Comments: Category=Galaxy Description=[Elliptical galaxies, Emission line galaxies, High-redshift galaxies, Lyman-break galaxies] Extended=YES				
	(2)	J1241+2219-B	RA: 12 41 29.7000 (190.3737500d) Dec: +22 19 43.10 (22.32864d) Equinox: J2000	Epoch of Position: 2000	
	Comments: Category=Galaxy Description=[Elliptical galaxies, Emission line galaxies, High-redshift galaxies, Lyman-break galaxies] Extended=YES				
	(3)	J1241+2219-C	RA: 12 41 29.6520 (190.3735500d) Dec: +22 19 46.27 (22.32952d) Equinox: J2000	Epoch of Position: 2000	
	Comments: Category=Galaxy Description=[Elliptical galaxies, Emission line galaxies, High-redshift galaxies, Lyman-break galaxies] Extended=YES				
(4)	J1241+2219-D	RA: 12 41 30.0780 (190.3753250d) Dec: +22 19 40.16 (22.32782d) Equinox: J2000	Epoch of Position: 2000		
Comments: Category=Galaxy Description=[Elliptical galaxies, Emission line galaxies, High-redshift galaxies, Lyman-break galaxies] Extended=YES					
(5)	J1241+2219-BACKGROUND	RA: 12 41 29.5590 (190.3731625d) Dec: +22 19 39.12 (22.32753d) Equinox: J2000	Epoch of Position: 2000		
Comments: Category=Galaxy Description=[Elliptical galaxies, Emission line galaxies, High-redshift galaxies, Lyman-break galaxies] Extended=YES					
(6)	Group J1241+2219				
Comments: Target Selection=[1 J1241+2219-A, 2 J1241+2219-B, 3 J1241+2219-C, 4 J1241+2219-D, 5 J1241+2219-BACKGROUND]					

Proposal 2566 - Observation 1 - Characterizing Stellar Mass Assembly and Physical Properties in the Brightest Galaxy in the Redshift...

Observation	Proposal 2566, Observation 1												Fri May 27 06:03:30 GMT 2022
	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		
	(6)	Group J1241+2219											
	Comments: Target Selection=[1 J1241+2219-A, 2 J1241+2219-B, 3 J1241+2219-C, 4 J1241+2219-D, 5 J1241+2219-BACKGROUND]												
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	G395M/F290LP	NRSIRS2	16	1	false	true	NONE	4	4	4726.8	59548.44	
	2	G235M/F170LP	NRSIRS2	16	1	false	true	NONE	4	4	4726.8	59548.45	

Proposal 2566 - Observation 4 - Characterizing Stellar Mass Assembly and Physical Properties in the Brightest Galaxy in the Redshift...

Observation	Proposal 2566, Observation 4										Fri May 27 06:03:30 GMT 2022	
	Diagnostic Status: Warning											
	Observing Template: NIRCam 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)	J1241+2219-B	RA: 12 41 29.7000 (190.3737500d) Dec: +22 19 43.10 (22.32864d) Equinox: J2000			Epoch of Position: 2000						
	Comments: Category=Galaxy Description=[Elliptical galaxies, Emission line galaxies, High-redshift galaxies, Lyman-break galaxies] Extended=YES											
Template	Module					Subarray						
	B					FULL						
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	F115W	F250M	BRIGHT2	10	1	4	4	858.942	59548.56		
	2	F150W	F335M	BRIGHT2	10	1	4	4	858.942	59548.57		
	3	F200W	F460M	BRIGHT2	9	1	4	4	773.047	59548.58		
Special Requirements	Offset 40.0 arcsec, 35.0 arcsec Background Limited. Background no more than 40th percentile above minimum											