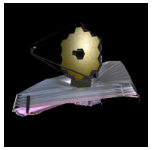

5221 - Mapping Cosmic Structure Evolution: Characterizing Two Massive Galaxy Protoclusters Anchored by z>7.5 Luminous Quasars

Cycle: 3, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	1	J0313	NIRCam Wide Field Slitless Spectroscopy	(1) J0313-1806

ABSTRACT

Structure formation models predict that the earliest billion-M_sun supermassive black holes must form in the most massive dark matter halos and can therefore be anchors of protoclusters in the Epoch of Reionization. We propose to study the environments of the two most high-redshift quasars (z>7.5) using a mosaic of NIRCam/WFSS to search for [OIII] emitters at the quasar redshifts. Both quasars show strong evidence of residing in large-scale overdense environments based on photometric selection of Lyman break galaxies using JWST NIRCam multiband imaging. However, the existing data is limited by: (1) a single pointing of NIRCam that cannot cover the full extent of protoclusters, and (2) broad-band photometric selections that do not probe the 3-D structure of the protoclusters. We will carry out NIRCam/WFSS mosaic observations that will cover 2.5 times the area of existing data, and measure precise redshifts that map the large-scale structure and kinematics of the protocluster member galaxies. We expect to confirm the spectroscopic redshifts of ~150 galaxies at z~7-9 and characterize the kinematics of ~50 galaxies in the close environments of these quasars in order to verify and characterize the properties of two of the most extreme high-z protoclusters anchored by quasars. These observations will allow us to calculate spatial clustering around z~7.5 to constrain dark matter halo mass, probe AGN activity in protocluster environments, and study galaxy formation and evolution in the most dense and active regions in the early universe.

OBSERVING DESCRIPTION

We target the two highest redshift quasars known, J0313-1806 (z=7.64) and J1342+0928 (z=7.54). The targets have existing single-pointing NIRCam imaging observations used to establish photometric redshifts. In this program, we propose to use a 2x2 NIRCam/WFSS GrismR mosaic to cover a 2.5 times larger area than the current observations. We request (X_offset, Y_offset) = (-31, 0) arcsecond in order to ensure the quasar has a full wavelength coverage and is covered by all four visits of the mosaic. We choose to only use Grism R in order to reduce the overhead. The confusion issue due to spectral overlap will be resolved by using the Hbeta+O3 line complex. Such a strategy has been used by many JWST programs in Cycle 1 and Cycle 2.

We use the following configuration for NIRCam/WFSS observations: F444W filter for WFSS observations in the long wavelength channel and F200W filter for imaging observations in the short wavelength channel. We will use F150W+F444W for direct imaging and out-of-field imaging. We will use the MEDIUM2 readout pattern for the WFSS exposures with a 3-point INTRAMODULEX primary dither and a two-point sub-pixel dither which results in 6000s per pointing. We will use the SHALLOW4 readout pattern for the direct and out-of-field imaging. This results in a total science exposure time of 15.97 hours and a total charged time of 24.5 hours.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	J0313-1806	RA: 03 13 43.8390 (48.4326625d) Dec: -18 06 36.40 (-18.11011d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[High-redshift galaxies, Quasars]

Observation

Proposal 5221, Observation 1: J0313

Wed Mar 13 20:00:16 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRCam Wide Field Slitless Spectroscopy

Diagnostics

(J0313 (Obs 1)) Warning (Form): This observation is split across multiple visits using multiple filters. Not selecting the sequence option may result in execution of the visits in a non-numerical order and is not recommended.

(J0313 (Obs 1)) Warning (Form): Use of only one of GRISMR or GRISMC may result in spectral overlap from multiple sources that can't be corrected. Users should address this issue in their proposal text.

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

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

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

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	J0313-1806	RA: 03 13 43.8390 (48.4326625d) Dec: -18 06 36.40 (-18.11011d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[High-redshift galaxies, Quasars]

Template

Module	Subarray	Grism (Long Wavelength)
ALL	FULL	GRISMR

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
2	2	25.0	60.0	0.0	0.0	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Positions
1	INTRAMODULEX	3	2-Point

Direct Image

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	Grism (Long Wavelength)	Exposure Type	Total Dithers
1	F150W	F444W	SHALLOW4	8	1	1	418.734		GRISMR	Direct Image	1

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	Grism (Long Wavelength)	Exposure Type	Total Dithers
1	F200W	F444W	MEDIUM2	10	1	6	5926.697		GRISMR	Grism (Long Wavelength)	6
2	F150W	F444W	SHALLOW4	8	1	2	837.468			Out of Field	2

Special Requirements	
	Group Visits within 53.0 Days Visits Same PA Offset -31.0 arcsec, 0.0 arcsec