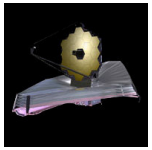

1243 - Exploring the End of Cosmic Reionization

Cycle: 1, Proposal Category: GTO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
NIRCam WFSS				
	1	J0100+2802	NIRCam Wide Field Slitless Spectroscopy	(1) J0100+2802
	2	J1148+5251	NIRCam Wide Field Slitless Spectroscopy	(2) J1148+5251
	3	J1030+0524	NIRCam Wide Field Slitless Spectroscopy	(3) J1030+0524
	4	J1120+0641	NIRCam Wide Field Slitless Spectroscopy	(4) J1120+0641
	5	J159-02	NIRCam Wide Field Slitless Spectroscopy	(5) J159-02
	6	J0148+0600	NIRCam Wide Field Slitless Spectroscopy	(6) J0148+0600

ABSTRACT

Our program is motivated to explore the evolution of the intergalactic medium and of circumgalactic environments at the tail end of reionization, and thereby to better understand the reionization process. In particular, we aim (1) to measure the correlation between HI Lyman alpha opacity (measured from high resolution ground-based quasar spectra) and the galaxy overdensity to understand the cause of the large variation in optical depth at z > 5.7, (2) to identify the host systems of metal absorption systems at z>5 in the quasar spectra to investigate the chemical enrichment and the ionization state of the gas in and around young galaxies, and (3) to characterize the nature of the quasar host galaxies and the surrounding large-

scale environment, and to measure their central black hale masses and via an accurate measurement of the systemic redshift, the size of the ionized near-zone.

We will use 110 hrs of GTO time to obtain deep NIRCam LW grism spectroscopy in the F356W filter (with corresponding direct images) and deep NIRCam SW direct images in F115W and F200W of 3 x 5 arcmin^2 mosaic fields centered on six luminous quasars at z>6, to achive these science goals. The R~1000 slitless spectroscopy will yield a complete census of emission-line selected galaxies at 5.3<z<7.0 with [OIII]4959,5007+Hbeta (the [OIII] doublet giving an unambiguous line identification) and at 3.7<z<5.1 with Halpha. We expect to measure redshifts and line fluxes down to a continuum flux of at least m~26.5 ABmag at 3.5um. This will yield an average of at least 20 [OIII]- and 100 Halpha-detected galaxies per field in these two redshift intervals. The broad-band images in the F356W, F200W and F115W filters will provide characterization of these galaxies in terms of their masses and star formation rates, being similar to the popular BzK diagnostic at z~2.

OBSERVING DESCRIPTION

We will use 110 hrs of GTO time to carry out deep NIRCam Wide-Field Slitless Spectroscopy (WFSS) in roughly 3x5 arcmin^2 mosaicked fields that are centered on a sample of six luminous quasars at z>6. The program consists of the spectroscopy using the R-grism and F356W filters, and simultaneous deep imaging in two SW filters (F115W and F200W). We aim to spectroscopically detect strong emission lines Hbeta+[OIII]4959,5007 for star-forming galaxies at 5.3<z<7.0, and Halpha at 3.7<z<5.1. We expect to measure redshifts and fluxes down to m~26.5 in F356W, assuming a rest-frame equivalent width (EW) of 400 Angstrom. Recent observations of Halpha/[OIII] EWs of high-z (z>4) galaxies justify the assumption of strong lines. The broad-band images in the two SW filters plus LW direct images in F356W will yield a tool, like the popular BzK diagnostic used at z~2, to characterize rest-frame optical SEDs, from which stellar masses, star formation rates, and stellar populations could be estimated for the spectroscopic targets and for further fainter sources that not spectroscopically detected.

The LW grism observations all use the F356W filter and the Grism R in both Modules A and B. The mosaic is built up by four overlapping pointings (resulting in four visits per field) that are designed to give a certain minimum exposure time (7473 sec) across the whole field, and to give four times this exposure time in a central area of about 40x40 arcsec^2 which will be centered on the target quasar. We will get two reversed grism spectra for all sources in a central strip of width 70 arcsec covered by both Modules.

The SW imaging observations using the F115W and F200W filters will be conducted in parallel to the LW spectroscopy with filter exchange in the middle of the LW exposures. The minimum exposure time is 3736 sec for each SW image, half the exposure time for the LW grism.

The direct imaging in LW F356W (for source identification) will be conducted at the end of the exposure series to have three images to fully cover the out-of-field region of the spectroscopic field-of-view. The exposure time of each LW image is 526 sec.

We employ the DEEP8 readout pattern for all exposures. The dithering patter is fixed to the 3-point INTERMODULE, with 4-point sub-pixel positions. As a result, we will acquire 24 spectroscopic frames (12 SW images per filter) for each pointing (visit). For each field (all six fields), the science exposure time is expected to be 9.75 (58.5) hrs, and the total charged time will be 18.1 (108.5) hrs.

Observation

Proposal 1243, Observation 1: J0100+2802

Tue Feb 20 22:47:05 GMT 2018

Diagnostic Status: Warning

Observing Template: NIRCam Wide Field Slitless Spectroscopy

Diagnostics

(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)	J0100+2802	RA: 01 00 13.0160 (15.0542333d) Dec: +28 02 25.80 (28.04050d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Redshift 6.3528
m_UV=17.69
4 OI absorption systems z=5.8, 5.95, 6.11, 6.15
MgII absorption systems z=4.22, 4.35, 4.52, 4.64, 5.34, 6.11, 6.14
Category=Galaxy
Description=[Quasars]
Extended=Unknown

Template

Module	*Subarray*	*Grism (Long Wavelength)*
ALL	FULL	GRISMR

Mosaic

Rows	*Columns*	*Row Overlap %*	*Column Overlap %*	*Row shift*	*Column shift*	*Tile Order*
2	2	45.0	72.0	0.0	-1.2	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Positions
1	INTRAMODULEX	3	4-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	F200W	F356W	SHALLOW4	10	1	1	536.838		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	F115W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
2	F200W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
3	F200W	F356W	SHALLOW4	10	1	2	1073.677			Out of Field	2

Special Requirements	
	Group Visits within 53.0 Days Aperture PA Range 60 to 65 Degrees (V3 60.0 to 65.0) Aperture PA Range 230 to 245 Degrees (V3 230.0 to 245.0) Visits Same PA Offset 4.0 arcsec, -3.5 arcsec

Observation

Proposal 1243, Observation 2: J1148+5251 Tue Feb 20 22:47:05 GMT 2018

Diagnostic Status: Warning

Observing Template: NIRCam Wide Field Slitless Spectroscopy

Diagnostics

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

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

(Visit 2:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 2:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	J1148+5251	RA: 11 48 16.6000 (177.0691667d) Dec: +52 51 50.00 (52.86389d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Redshift 6.4189
m_UV=19.2
Absorption systems:CIV=4.8, 4.8, 4.9, 5.0, 5.5, 5.7, 5.7, 6.0
Category=Galaxy
Description=[Quasars]
Extended=Unknown

Template

Module	*Subarray*	*Grism (Long Wavelength)*
ALL	FULL	GRISMR

Mosaic

Rows	*Columns*	*Row Overlap %*	*Column Overlap %*	*Row shift*	*Column shift*	*Tile Order*
2	2	45.0	72.0	0.0	-1.2	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Positions
1	INTRAMODULEX	3	4-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	F200W	F356W	SHALLOW4	10	1	1	536.838		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	F115W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
2	F200W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
3	F200W	F356W	SHALLOW4	10	1	2	1073.677			Out of Field	2

Special Requirements	
	Group Visits within 53.0 Days Aperture PA Range 220 to 280 Degrees (V3 220.0 to 280.0) Visits Same PA Offset 4.0 arcsec, -3.5 arcsec

Observation

Proposal 1243, Observation 3: J1030+0524

Tue Feb 20 22:47:05 GMT 2018

Diagnostic Status: Warning

Observing Template: NIRCam Wide Field Slitless Spectroscopy

Diagnostics

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

(Visit 3:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.

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

(Visit 3:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	J1030+0524	RA: 10 30 27.0910 (157.6128792d) Dec: +05 24 55.10 (5.41531d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Redshift 6.308
m_UV=19.8
Absorption systems: OI at z=6.0, 6.1, 6.2, 6.3
Category=Galaxy
Description=[Quasars]
Extended=Unknown

Template

Module	*Subarray*	*Grism (Long Wavelength)*
ALL	FULL	GRISMR

Mosaic

Rows	*Columns*	*Row Overlap %*	*Column Overlap %*	*Row shift*	*Column shift*	*Tile Order*
2	2	45.0	72.0	0.0	-1.2	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Positions
1	INTRAMODULEX	3	4-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	F200W	F356W	SHALLOW4	10	1	1	536.838		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	F115W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
2	F200W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
3	F200W	F356W	SHALLOW4	10	1	2	1073.677			Out of Field	2

Special Requirements	
	Group Visits within 53.0 Days Aperture PA Range 105 to 110 Degrees (V3 105.0 to 110.0) Visits Same PA Offset 4.0 arcsec, -3.5 arcsec

Observation

Proposal 1243, Observation 4: J1120+0641 Tue Feb 20 22:47:05 GMT 2018

Diagnostic Status: Warning

Observing Template: NIRCam Wide Field Slitless Spectroscopy

Comments: NIRCam obsevations in this field will be used fos pre-imaging and sample selection for a NIRSpec MSA observation in GTO time (GTO 1222; PI Chris J. Willott).

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 4:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 4:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 4:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	J1120+0641	RA: 11 20 1.4800 (170.0061667d) Dec: +06 41 24.30 (6.69008d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Redshift 7.0842
m_UV=20.38
Note: the target itself is out of the range of F356W.
Category=Galaxy
Description=[Quasars]
Extended=Unknown

Template

Module	*Subarray*	*Grism (Long Wavelength)*
ALL	FULL	GRISMR

Mosaic

Rows	*Columns*	*Row Overlap %*	*Column Overlap %*	*Row shift*	*Column shift*	*Tile Order*
2	2	45.0	72.0	0.0	-1.2	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Positions
1	INTRAMODULEX	3	4-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	F200W	F356W	SHALLOW4	10	1	1	536.838		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	F115W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
2	F200W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
3	F200W	F356W	SHALLOW4	10	1	2	1073.677			Out of Field	2

Special Requirements	
	Group Visits within 53.0 Days Aperture PA Range 290 to 300 Degrees (V3 290.0 to 300.0) Visits Same PA Offset 4.0 arcsec, -3.5 arcsec

Observation

Proposal 1243, Observation 5: J159-02

Tue Feb 20 22:47:05 GMT 2018

Diagnostic Status: Warning

Observing Template: NIRCam Wide Field Slitless Spectroscopy

Diagnostics

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 5:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 5:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 5:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	J159-02	RA: 10 36 54.1900 (159.2257917d) Dec: -02 32 37.94 (-2.54387d) Equinox: J2000		

Comments: Redshift 6.35

This is a recently-identified quasar at z=6.35. Moderately luminous (m_UV=19.9)
MgII absorption lines are identified at z=4.3, 6.1, 6.2.
Category=Galaxy
Description=[Quasars]
Extended=Unknown

Template

Module	*Subarray*	*Grism (Long Wavelength)*
ALL	FULL	GRISMR

Mosaic

Rows	*Columns*	*Row Overlap %*	*Column Overlap %*	*Row shift*	*Column shift*	*Tile Order*
2	2	45.0	72.0	0.0	-1.2	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Positions
1	INTRAMODULEX	3	4-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	F200W	F356W	SHALLOW4	10	1	1	536.838		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	F115W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
2	F200W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
3	F200W	F356W	SHALLOW4	10	1	2	1073.677			Out of Field	2

Special Requirements	
	Group Visits within 53.0 Days Aperture PA Range 105 to 110 Degrees (V3 105.0 to 110.0) Visits Same PA Offset 4.0 arcsec, -3.5 arcsec

Observation

Proposal 1243, Observation 6: J0148+0600

Tue Feb 20 22:47:05 GMT 2018

Diagnostic Status: Warning

Observing Template: NIRCam Wide Field Slitless Spectroscopy

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 6:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 6:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 6:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	J0148+0600	RA: 01 48 37.6390 (27.1568292d) Dec: +06 00 20.01 (6.00556d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Redshift 5.98
This is a luminous quasar at 5.98, which displays the unusually deep and long Gunn-Peterson trough at z~5.7.
Category=Galaxy
Description=[Quasars]
Extended=Unknown

Template

Module	*Subarray*	*Grism (Long Wavelength)*
ALL	FULL	GRISMR

Mosaic

Rows	*Columns*	*Row Overlap %*	*Column Overlap %*	*Row shift*	*Column shift*	*Tile Order*
2	2	45.0	72.0	0.0	-1.2	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Positions
1	INTRAMODULEX	3	4-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	F200W	F356W	SHALLOW4	10	1	1	536.838		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	F115W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
2	F200W	F356W	SHALLOW4	6	1	12	3865.237		GRISMR	Grism (Long Wavelength)	12
3	F200W	F356W	SHALLOW4	10	1	2	1073.677			Out of Field	2

Special Requirements	
	Group Visits within 53.0 Days Aperture PA Range 66 to 70 Degrees (V3 66.0 to 70.0) Visits Same PA Offset 4.0 arcsec, -3.5 arcsec