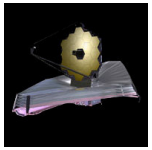

5943 - What really are the Physical Properties of Galaxies in the Epoch of Reionization?

Cycle: 3, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
plan1008				

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	15	pointing2-pa268_new_c1_x5	NIRSpec MultiObject Spectroscopy	(35) pointing2_pa268_c1
plan 2002				
	20	pointing1-pa271_new_c1_p24	NIRSpec MultiObject Spectroscopy	(31) pointing1_pa271_c1

ABSTRACT

In its first year, JWST has identified and characterized galaxies into the epoch of reionization. These observations have shown that galaxies appear extreme, with high nebular ionization powered by young, metal-poor stellar populations and possibly accretion onto lower-mass supermassive black holes. These observations challenge our models because they push to the limits of our parameter-space. To make progress requires we detect weaker metal lines in the rest-UV and optical to understand the physical details of these galaxies. Here we propose deep, spectroscopic observations of galaxies at high redshift using two pointings of NIRSpec with 9.1 hrs in G395M and 11.5 hrs in G140M. We target 11 galaxies at $6.9 < z < 8.9$ with known spectroscopic redshifts, combined with 48 candidate galaxies at $5.8 < z < 9$ and 7 more at $z > 9$ with photometric redshifts. We will use these observations to measure accurate fluxes, equivalent widths, and flux ratios of weaker lines: OIII] 1661,1666 and [CIII] 1907 + CIII] 1909 lines in the rest-UV (G140M) and probe for other high-ionization lines such as He II 1640; the [OIII] 4363 auroral line, [OII] 3726, 3729 and other lines in G395M. We will then use these lines, combined with strong nebular emission lines to measure the galaxies' (i) ionization states, (2) gas temperatures and 12 + log O/H abundances, (3) ages and SFRs, (4) C/O abundances, (5) gas densities, (6) dust attenuation and the dust law, and (7) search for indications of AGN. This will be a major legacy dataset for JWST, providing data to understand the detailed physical conditions in the earliest galaxies.

OBSERVING DESCRIPTION

We observe with NIRSpec in two pointings. Each pointing is split into four observations. We have designed the MSA configurations using MPT. We opt for 3-slit dithers to mitigate against stuck shutters and to allow more targets to receive observations. We also will manually open additional slits for objects where that is possible. Each observation has a different MSA configuration: the primary and secondary targets are the same in each configuration but the tertiary and filler targets change in each observation.

For each NIRSpec pointing we will observe with G140M and F290LP/G395M. For each pointing, we have split our observations into four observations. Each observation block contains 4 observations of G140M and 4 observations of G395M. Each observation of G140M includes one exposure with 18 groups/int and 3 int(egration)s, and each of these receives three dithered observations. Each observation of G395M includes one exposure with 21 groups/int and 2 int again with three dithers. We use the NRSIRS2 readout mode as this produces observations with up to 20%

less readout-noise and it greatly reduces the 1/f noise, which is very important for measuring the sky background (see proposal for references for this). The total exposure times are therefore: 11948.3 s x 4 observations = 47.8 ks for G140M; 9278.5 s x 4 observations =37.1 ks for G395M.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(31)	pointing1_pa271_c1	RA: 14 19 53.0726 (214.9711358d) Dec: +52 55 54.92 (52.93192d) Equinox: J2000		
Comments: *Description=[]*				
(32)	pointing1_pa271_c2	RA: 14 19 53.0633 (214.9710971d) Dec: +52 55 54.92 (52.93192d) Equinox: J2000		
Comments: *Description=[]*				
(33)	pointing1_pa271_c3	RA: 14 19 53.0622 (214.9710925d) Dec: +52 55 54.92 (52.93192d) Equinox: J2000		
Comments: *Description=[]*				
(34)	pointing1_pa271_c4	RA: 14 19 53.0534 (214.9710558d) Dec: +52 55 54.92 (52.93192d) Equinox: J2000		
Comments: *Description=[]*				
(35)	pointing2_pa268_c1	RA: 14 19 27.2502 (214.8635425d) Dec: +52 51 28.89 (52.85803d) Equinox: J2000		
Comments: *Description=[]*				
(36)	pointing2_pa268_c2	RA: 14 19 27.2499 (214.8635412d) Dec: +52 51 28.89 (52.85803d) Equinox: J2000		
Comments: *Description=[]*				
(37)	pointing2_pa268_c3	RA: 14 19 27.2499 (214.8635412d) Dec: +52 51 28.89 (52.85803d) Equinox: J2000		
Comments: *Description=[]*				
(38)	pointing2_pa268_c4	RA: 14 19 27.2444 (214.8635183d) Dec: +52 51 28.90 (52.85803d) Equinox: J2000		
Comments: *Description=[]*				

Observation

Proposal 5943, Observation 15: pointing2-pa268_new_c1_x5 Thu Apr 17 18:00:38 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

(Visit 15:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 15:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(35)	pointing2_pa268_c1	RA: 14 19 27.2502 (214.8635425d) Dec: +52 51 28.89 (52.85803d) Equinox: J2000		

Comments:
Description=[]

Acquisition

#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	Filter: F110W; Readout: NRSRAPIDD6; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	F110W	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	
2	Filter: F110W; Readout: NRSRAPIDD6; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	F110W	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	

Template

TA Method	HFF Readout Mode	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold
MSATA	false	No	MSA Center	p2c1 (38 sources)	f2c1 (12690 sources)	jwst-nirspec-mr	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	13725	214.870761	52.833141	22	1	20193	214.876882	52.870965	21.43
1	15675	214.899696	52.863394	21.925	1	20494	214.840280	52.844788	21.584
1	18990	214.840340	52.839101	22.747	1	21847	214.830807	52.846659	22.366
1	19652	214.888652	52.876499	23.048	1	24067	214.842762	52.867141	23.57
Visit	**ID**	**RA**	**Dec**	**Magnitude**	**Visit**	**ID**	**RA**	**Dec**	**Magnitude**
2	13725	214.870761	52.833141	22	2	20193	214.876882	52.870965	21.43
2	15675	214.899696	52.863394	21.925	2	20494	214.840280	52.844788	21.584
2	18990	214.840340	52.839101	22.747	2	21847	214.830807	52.846659	22.366
2	19652	214.888652	52.876499	23.048	2	24067	214.842762	52.867141	23.57

Spectral Elements

#	Exposure Specification	MSA Configuration	Nod Pattern	Pointing	Aperture PA	Dispersion Offset (Shutters)	Cross-Dispersion Offset (Shutters)	Total Dithers	Total Integrations	Total Exposure Time
1	1 (G140M/F100LP)	c1	3 Shutter Slitlet	214.85820541666666 Degrees 52.856986111111 11 Degrees	267.54895146476235			3	9	11948.301
2	2 (G395M/F290LP)	c1	3 Shutter Slitlet	214.85820541666666 Degrees 52.856986111111 11 Degrees	267.54895146476235			3	6	9278.534
3	1 (G140M/F100LP)	5943.p33c1e1n1	3 Shutter Slitlet	214.85820541666666 Degrees 52.856986111111 11 Degrees	267.54895146476235			3	9	11948.301
4	2 (G395M/F290LP)	5943.p33c1e1n1	3 Shutter Slitlet	214.85820541666666 Degrees 52.856986111111 11 Degrees	267.54895146476235			3	6	9278.534
5	1 (G140M/F100LP)	5943.p34c1e1n1	3 Shutter Slitlet	214.85820541666666 Degrees 52.856986111111 11 Degrees	267.54895146476235			3	9	11948.301
6	2 (G395M/F290LP)	5943.p34c1e1n1	3 Shutter Slitlet	214.85820541666666 Degrees 52.856986111111 11 Degrees	267.54895146476235			3	6	9278.534
7	1 (G140M/F100LP)	5943.p35c1e1n1	3 Shutter Slitlet	214.85820541666666 Degrees 52.856986111111 11 Degrees	267.54895146476235			3	9	11948.301
8	2 (G395M/F290LP)	5943.p35c1e1n1	3 Shutter Slitlet	214.85820541666666 Degrees 52.856986111111 11 Degrees	267.54895146476235			3	6	9278.534

Special Requirements

Group Visits within 53.0 Days
Visits Same PA
MSA Scheduled Aperture PA 267.5532 to 267.5532 Degrees (V3 128.97862 to 128.97862)

Observation

Proposal 5943, Observation 20: pointing1-pa271_new_c1_p24 Thu Apr 17 18:00:38 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

(Visit 20:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 20:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(31)	pointing1_pa271_c1	RA: 14 19 53.0726 (214.9711358d) Dec: +52 55 54.92 (52.93192d) Equinox: J2000		

Comments:
Description=[]

Acquisition

#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	Filter: F110W; Readout: NRSRAPIDD6; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	F110W	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	
2	Filter: F110W; Readout: NRSRAPIDD6; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	F110W	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	

Template

TA Method	HFF Readout Mode	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold
MSATA	false	No	MSA Center	p1c1 (35 sources)	f1c1 (11490 sources)	jwst-nirspec-mr	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	10934	215.002397	52.912034	21.89	1	18917	215.005163	52.955671	23.556
1	16408	214.961879	52.910709	21.442	1	19845	214.962787	52.930409	22.023
1	16802	215.001648	52.942915	23.731	1	24685	214.950404	52.946649	22.842
1	17079	215.008591	52.948860	22.345	1	25336	214.955342	52.951288	21.392
Visit	**ID**	**RA**	**Dec**	**Magnitude**	**Visit**	**ID**	**RA**	**Dec**	**Magnitude**
2	10934	215.002397	52.912034	21.89	2	18917	215.005163	52.955671	23.556
2	16408	214.961879	52.910709	21.442	2	19845	214.962787	52.930409	22.023
2	16802	215.001648	52.942915	23.731	2	24685	214.950404	52.946649	22.842
2	17079	215.008591	52.948860	22.345	2	25336	214.955342	52.951288	21.392

Spectral Elements

#	Exposure Specification	MSA Configuration	Nod Pattern	Pointing	Aperture PA	Dispersion Offset (Shutters)	Cross-Dispersion Offset (Shutters)	Total Dithers	Total Integrations	Total Exposure Time
1	1 (G140M/F100LP)	c1	3 Shutter Slitlet	214.97768166666665 Degrees 52.93439166666666 Degrees	270.89301364046975			3	9	11948.301
2	2 (G395M/F290LP)	c1	3 Shutter Slitlet	214.97768166666665 Degrees 52.93439166666666 Degrees	270.89301364046975			3	6	9278.534
3	1 (G140M/F100LP)	5943.p14c1e1n1	3 Shutter Slitlet	214.97768166666665 Degrees 52.93439166666666 Degrees	270.89301364046975			3	9	11948.301
4	2 (G395M/F290LP)	5943.p14c1e1n1	3 Shutter Slitlet	214.97768166666665 Degrees 52.93439166666666 Degrees	270.89301364046975			3	6	9278.534
5	1 (G140M/F100LP)	5943.p15c1e1n1	3 Shutter Slitlet	214.97768166666665 Degrees 52.93439166666666 Degrees	270.89301364046975			3	9	11948.301
6	2 (G395M/F290LP)	5943.p15c1e1n1	3 Shutter Slitlet	214.97768166666665 Degrees 52.93439166666666 Degrees	270.89301364046975			3	6	9278.534
7	1 (G140M/F100LP)	5943.p16c1e1n1	3 Shutter Slitlet	214.97768166666665 Degrees 52.93439166666666 Degrees	270.89301364046975			3	9	11948.301
8	2 (G395M/F290LP)	5943.p16c1e1n1	3 Shutter Slitlet	214.97768166666665 Degrees 52.93439166666666 Degrees	270.89301364046975			3	6	9278.534

Special Requirements

Group Visits within 53.0 Days
Visits Same PA
MSA Scheduled Aperture PA 270.8878 to 270.8878 Degrees (V3 132.31326 to 132.31326)