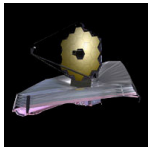

2123 - A Pathfinder for JWST Spectroscopy: Deep High Spectral Resolution Maps of Galaxies over 1<z<6

Cycle: 1, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	605	NIRSpec MultiObject Spectroscopy	(4) 605

ABSTRACT

We propose deep, spatially resolved NIRSpec MSA near-IR spectroscopy of ~40 galaxies at redshifts 1<z<6 in the Hubble Ultra Deep Field. We will use the higher resolution R=2700 grating and "slitlet stepping" across the galaxies to obtain spatially resolved spectroscopy of emission and absorption lines in 2-D. Slitlet stepping exploits the multiplex and sensitivity advantages of the MSA to carry out a survey in a vastly shorter time than a large IFU sample would require.

The spectroscopic maps of restframe optical and near-UV lines will break new ground in measuring evolution of galaxy outflows, and the evolution of rotation vs. disordered motions, as massive galaxies evolve from an era dominated by filamentary cold-mode accretion to primarily hot-mode accretion and AGN feedback. These high-S/N spatial maps will enable: comparisons of the kinematics of gas and stars; Balmer-decrement measurements for both the broad (wind) and narrow (ISM) components of emission lines; spatially resolved nebular diagnostics of metallicity, excitation, and ISM pressure; AGN and shock signatures in both the centers and extended regions of galaxies; and star-formation and extinction maps from multiple spectroscopic indicators. These observations will be made public immediately, and will serve as a pathfinder for the JWST community to explore the revolutionary science return from deep JWST spectroscopy of high-z galaxies at high spatial and spectral resolution.

OBSERVING DESCRIPTION

The NIRSpec Micro-Shutter Array (MSA) in the G235H grating will be used to create IFU-like maps of 40 galaxies in a single pointing, using new mode which we call "slitlet stepping." Depending on the galaxy size, 1-8 unique slitlets are designed to cover the entire galaxy. The slitlets also vary in length from 1 to 6 shutters to cover the entire galaxy. The total exposure time for each galaxy is 57 hours. Targets at higher redshift are fainter and smaller, and fewer slitlets are applied to them to increase the exposure time per slitlet. We strongly recommend the reviewers to refer to Figures 4 & 5 in Technical Justification of our proposal for more details about slitlet stepping.

We implement the slitlet stepping by adding a one-shutter offset along the dispersion direction to the pointing for each step. There are 8 slitlet steps in total, which correspond to the 8 MSA configurations in the APT (c1step1...8). We design one unique MSA configuration for each slitstep because, as the pointing changes from step to step, we need to recenter the slitlets onto some small galaxies which are to be covered by <8 unique slitelets (refer to Figure 5). Additionally, each of the 8 slitlet steps is dithered by a small amount (0.05") in the dispersion (0.185 shutter) and cross-dispersion directions (0.094 shutter). The dithers are added to the pointing offsets on top of the slitlet stepping in the Configurations/Pointings table. Each of MSA configuration has 4 dithers. This leads to a total of 32 exposures.

Because we are doing slitlet stepping, some galaxies may not show as being inside the opened shutters when viewed in the MSA Planning Tool. This is because the input RAs and DECs represent the coordinates of galaxy centers, and some of the slitlet steps observe their outer parts. We have verified that the opened shutters do indeed land on the parts of these galaxies that we want to observe using the archival HST WFC3/F160W mosaics. A total of 40 objects will be observed.

An example pointing with a placeholder NIRSPEC APA is submitted, but our APA can vary between 25 and 210 degrees (North = 0 deg and East = 90 deg). A Special Requirement is submitted which states this.The target list will be updated by us and the MSA shutters will be replanned once we are offered a final APA.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	POINTIDS151-11-15WEIGHTED	RA: 03 32 38.0265 (53.1584437d) Dec: -27 47 19.01 (-27.78861d) Equinox: J2000		
Comments: *Description=[]*				
(3)	489	RA: 03 32 37.9351 (53.1580629d) Dec: -27 48 43.37 (-27.81205d) Equinox: J2000		
Comments: *Description=[]*				
(4)	605	RA: 03 32 36.6392 (53.1526633d) Dec: -27 48 19.39 (-27.80539d) Equinox: J2000		
Comments: *Description=[]*				

Observation

Proposal 2123, Observation 1: 605

Tue Sep 17 17:00:27 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Comments: 1. An example pointing with a placeholder NIRSPEC APA is submitted, but our APA can vary between 25 and 210 degrees (North = 0 deg and East = 90 deg). A Special Requirement is submitted which states this. The target list will be updated by us and the MSA shutters will be replanned once we are offered a final APA.

2. There are 8 MSA configurations in the APT (c1step1...8). They correspond to the 8 slitlet steps we will perform (refer to Figure 4 and Technical Justification in the proposal). For each configuration, 4 small 0.05" dithers are made. This leads to a total of 32 exposures.

3. Each of the slitlet steps is listed as a different MSA configuration. Each configuration is dithered by 0.05" in the dispersion and cross-dispersion directions. Each of these dithers results in a separate configuration.

4. Because we are doing slitlet stepping, some galaxies may not show as being inside the opened shutters when viewed in the MSA Planning Tool. This is because the input RAs and DECs represent the coordinates of galaxy centers, and some of the slitlet steps observe their outer parts. We have verified that the opened shutters do indeed land on the parts of these galaxies that we want to observe by using the build-in Aladin viewer and the archival HST WFC3/F160W mosaics. A total of 40 objects will be observed.

5. We will create a master sky using 12 sky slitlets identified by hand. They are near the left edge of the MSA and each has a length of 3 shutters. We did not use the "mastersky" option in MSA Planning tool to identify these. We will modify the pipeline to handle this.

Diagnostics

(605 (Obs 1)) Warning (Form): Config centerstep (#11) has 3 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config centerstep (#12) has 3 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config centerstep (#13) has 3 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config centerstep (#14) has 3 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config centerstep-b (#22) has 3 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminusone (#10) has 1 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminusone (#6) has 1 filler slits affected by failed closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminusone (#6) has 1 primary slits affected by failed closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminusone (#7) has 1 filler slits affected by failed closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminusone (#7) has 1 primary slits affected by failed closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminusone (#8) has 1 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminusone (#9) has 1 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminustwo (#1) has 1 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminustwo (#1) has 2 filler slits affected by failed closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminustwo (#1) has 2 primary slits affected by failed closed shutters.
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(605 (Obs 1)) Warning (Form): Config stepminustwo (#2) has 2 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config stepminustwo (#3) has 1 filler slits affected by failed closed shutters.
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(605 (Obs 1)) Warning (Form): Config stepone (#15) has 1 filler slits affected by failed closed shutters.
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(605 (Obs 1)) Warning (Form): Config stepone (#16) has 1 filler slits affected by failed closed shutters.
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(605 (Obs 1)) Warning (Form): Config stepone (#17) has 4 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config stepone (#18) has 4 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config stepone (#19) has 1 filler slits affected by failed closed shutters.
(605 (Obs 1)) Warning (Form): Config stepone (#19) has 1 primary slits affected by failed closed shutters.
(605 (Obs 1)) Warning (Form): Config stepone (#19) has 3 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config stepthree (#26) has 1 filler slits affected by failed closed shutters.
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(605 (Obs 1)) Warning (Form): Config stepthree (#30) has 1 filler slits affected by failed closed shutters.

(605 (Obs 1)) Warning (Form): Config stepthree (#30) has 1 primary slits affected by failed closed shutters.
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(605 (Obs 1)) Warning (Form): Config steptwo (#20) has 1 primary slits affected by failed closed shutters.
(605 (Obs 1)) Warning (Form): Config steptwo (#21) has 2 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config steptwo-b (#23) has 1 filler slits affected by failed closed shutters.
(605 (Obs 1)) Warning (Form): Config steptwo-b (#23) has 1 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config steptwo-b (#23) has 1 primary slits affected by failed closed shutters.
(605 (Obs 1)) Warning (Form): Config steptwo-b (#24) has 2 master background shutters affected by failed open or closed shutters.
(605 (Obs 1)) Warning (Form): Config steptwo-b (#25) has 2 master background shutters affected by failed open or closed shutters.
(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.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	605	RA: 03 32 36.6392 (53.1526633d) Dec: -27 48 19.39 (-27.80539d) 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: CLEAR; Readout: NRSRAPIDD2; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	CLEAR	Auto Acq MSA Config	NRSRAPIDD2	3	1	4	343.577	
2	Filter: CLEAR; Readout: NRSRAPIDD1; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	CLEAR	Auto Acq MSA Config	NRSRAPIDD1	3	1	4	257.682	
3	Filter: CLEAR; Readout: NRSRAPIDD1; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	CLEAR	Auto Acq MSA Config	NRSRAPIDD1	3	1	4	257.682	

Template

TA Method	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold
MSATA	After Target ACQ	MSA Center	605 (248 sources)	605 (248 sources)	jwst-nirspec-g235h	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	5807	53.185848	-27.810033	23.3258502	1	198662	53.109533	-27.813602	24.3925503
1	9073	53.141909	-27.827235	22.2046964	1	204028	53.114175	-27.793521	23.9225041
1	9908	53.175353	-27.819969	22.8923541	1	208763	53.147782	-27.777019	23.5003989
1	16706	53.148602	-27.770267	22.6030053	1	210360	53.152900	-27.772572	24.7297922
Visit	**ID**	**RA**	**Dec**	**Magnitude**	**Visit**	**ID**	**RA**	**Dec**	**Magnitude**
2	9073	53.141909	-27.827235	22.2046964	2	197522	53.112386	-27.817183	24.1617383
2	9471	53.147960	-27.823975	21.9733918	2	198662	53.109533	-27.813602	24.3925503
2	9908	53.175353	-27.819969	22.8923541	2	204028	53.114175	-27.793521	23.9225041
2	16706	53.148602	-27.770267	22.6030053	2	208763	53.147782	-27.777019	23.5003989
Visit	**ID**	**RA**	**Dec**	**Magnitude**	**Visit**	**ID**	**RA**	**Dec**	**Magnitude**
3	9073	53.141909	-27.827235	22.2046964	3	197522	53.112386	-27.817183	24.1617383
3	9471	53.147960	-27.823975	21.9733918	3	198662	53.109533	-27.813602	24.3925503
3	9908	53.175353	-27.819969	22.8923541	3	204028	53.114175	-27.793521	23.9225041
3	16706	53.148602	-27.770267	22.6030053	3	208763	53.147782	-27.777019	23.5003989

Confirmation

#	Confirmation Type	Conf. Readout Pattern	Conf. Groups/Int	Conf. Integrations/Exp	Conf. Total Integrations	Conf. Total Exposure Time
1	After Target Acq	NRSIRS2RAPID	65	1	1	962.867
2	After Target Acq	NRSIRS2RAPID	65	1	1	962.867
3	After Target Acq	NRSIRS2RAPID	65	1	1	962.867

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 (G235H/F170LP)	stepminustwo		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887107957229 17	-2.0		1	3	7046.434
2	1 (G235H/F170LP)	stepminustwo		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887131203530 51	-1.667	-0.25	1	3	7046.434
3	1 (G235H/F170LP)	stepminustwo		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887114673375 606	-2.333	-0.25	1	3	7046.434
4	1 (G235H/F170LP)	stepminustwo		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887084711447 04	-2.333	0.25	1	3	7046.434
5	1 (G235H/F170LP)	stepminustwo		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887101241307 51	-1.667	0.25	1	3	7046.434
6	1 (G235H/F170LP)	stepminusone		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887109531135 23	-1.333	0.25	1	3	7046.434
7	1 (G235H/F170LP)	stepminusone		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887139493505 94	-1.333	-0.25	1	3	7046.434
8	1 (G235H/F170LP)	stepminusone		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887156023971 88	-0.667	-0.25	1	3	7046.434
9	1 (G235H/F170LP)	stepminusone		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887126061306 496	-0.667	0.25	1	3	7046.434
10	1 (G235H/F170LP)	stepminusone		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887132777293 8	-1.0		1	3	7046.434
11	1 (G235H/F170LP)	centerstep		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887164314103 5	-0.333	-0.25	1	3	7046.434
12	1 (G235H/F170LP)	centerstep		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887180844881 236	0.333	-0.25	1	3	7046.434
13	1 (G235H/F170LP)	centerstep		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887134351290 26	-0.333	0.25	1	3	7046.434
14	1 (G235H/F170LP)	centerstep		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887150881773 06	0.333	0.25	1	3	7046.434

#	Exposure Specification	MSA Configuration	Nod Pattern	Pointing	Aperture PA	Dispersion Offset (Shutters)	Cross-Dispersion Offset (Shutters)	Total Dithers	Total Integrations	Total Exposure Time
15	1 (G235H/F170LP)	stepone		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887159171913 254	0.667	0.25	1	3	7046.434
16	1 (G235H/F170LP)	stepone		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887189135169 44	0.667	-0.25	1	3	7046.434
17	1 (G235H/F170LP)	stepone		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887205666259 746	1.333	-0.25	1	3	7046.434
18	1 (G235H/F170LP)	stepone		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887175702708 355	1.333	0.25	1	3	7046.434
19	1 (G235H/F170LP)	stepone		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887182418826 434	1.0		1	3	7046.434
20	1 (G235H/F170LP)	steptwo		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887207240296 72	2.0		1	3	7046.434
21	1 (G235H/F170LP)	steptwo		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887200524113 545	2.333	0.25	1	3	7046.434
22	1 (G235H/F170LP)	centerstep-b		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887157597825 84	0.0		1	3	7046.434
23	1 (G235H/F170LP)	steptwo-b		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887230488108 514	2.333	-0.25	1	3	7046.434
24	1 (G235H/F170LP)	steptwo-b		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887213956704 876	1.667	-0.25	1	3	7046.434
25	1 (G235H/F170LP)	steptwo-b		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887183993005 365	1.667	0.25	1	3	7046.434
26	1 (G235H/F170LP)	stepthree		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887225345989 734	3.333	0.25	1	3	7046.434
27	1 (G235H/F170LP)	stepthree		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887208814567 75	2.667	0.25	1	3	7046.434
28	1 (G235H/F170LP)	stepthree		53.142031666666 67 Degrees - 27.805841666666 65 Degrees	50.887238778710 97	2.667	-0.25	1	3	7046.434

	#	Exposure Specification	MSA Configuration	Nod Pattern	Pointing	Aperture PA	Dispersion Offset (Shutters)	Cross-Dispersion Offset (Shutters)	Total Dithers	Total Integrations	Total Exposure Time
	29	1 (G235H/F170LP)	stepthree		53.142031666666 67 Degrees -27.805841666666 65 Degrees	50.887255310428 7	3.333	-0.25	1	3	7046.434
	30	1 (G235H/F170LP)	stepthree		53.142031666666 67 Degrees -27.805841666666 65 Degrees	50.887232062237 85	3.0	0.0	1	3	7046.434
Special Requirements	Group Visits within 53.0 Days Aperture PA Range 25 to 210 Degrees (V3 246.42543030000002 to 71.4254303) Visits Same PA MSA Scheduled Aperture PA 50.8822 to 50.8822 Degrees (V3 272.30765 to 272.30765)										