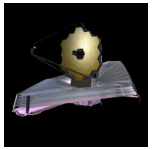

3426 - Confirming the population of disk galaxies at z>3

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	pointing_fin	NIRSpec MultiObject Spectroscopy	(3) ready_pointing_fin_extraTA_3

ABSTRACT

Early deep-field images from JWST have revealed morphologies of high-redshift galaxies that suggest a surprisingly high fraction of disk galaxies at z>3. If confirmed, these results indicate that disks are able to form and settle at earlier times and lower mass scales than predicted by current

cosmological simulations. However, resolved spectroscopic data is required to unambiguously confirm the presence of disk galaxies and characterize their dynamical state.

We propose to use the multiplexed NIRSpec MSA in slit-stepping mode to spatially map 40-50 galaxies at z=2.4-3.6 (with 30-35 at z>3) with 3-D spectroscopy. This proposal will chart the nebular emission kinematics, allowing us to determine the true fraction of disks and their dynamical properties (in particular the degree of rotational support versus random motion, V/sigma). We will simultaneously measure resolved star formation and metallicity, to understand how the formation of galactic disks is governed by cosmological accretion and feedback. Our target selection provides good sampling across stellar masses 10^9 - 10^11 Msun, enabling us to probe mass-dependent trends at this epoch.

Resolving the formation of disk galaxies at z>3 can only be achieved with JWST's unique spatial and spectral resolution at the relevant wavelengths. This program represents a highly efficient survey of the galaxy population at this epoch, requiring a factor 25x less total integration time than the traditional IFU mode.

OBSERVING DESCRIPTION

We propose a multiplexed integral field spectroscopy (IFS) survey of galaxies at z=2.4-3.6 in the EGS field (mostly at z>3) with the NIRSpec MSA, using a slit-stepping methodology to obtain pseudo-IFU datacubes of 40-50 targets on a single MSA configuration. Our targets are selected to span the normal star forming population with stellar mass > 10^9 Msun. The slit stepping approach is >25 times more efficient than the NIRSpec IFU thanks to the sensitivity and multiplexing capability of the MSA.

Slit-stepping dither pattern:

We utilize a slit-stepping pattern with 5 "steps" of 0.2 arcsec (= 1 slitlet width) along the dispersion direction, and 7 dithers of 0.075 arcsec (= 1 bar shadow width) along the cross-dispersion direction. Cross-dispersion steps will eliminate bar shadows and ensure almost perfectly uniform integration time across the resulting pseudo-IFU datacubes. The area is thus 1.0x1.5 arcsec with uniform coverage for a (3+1)-slitlet datacube.

Instrument setup, depth, and exposure times:

We use the G235H grating and F170LP filter to map the strong nebular emission lines Halpha, [N II]6548,6584, [S II]6717,6731, Hbeta, and [O III]4959,5007 in all targets. We will use these lines to measure spatially resolved kinematics, metallicity, star formation rate, and BPT ionization diagnostics on 0.1x0.2 arcsecond spatial scales. The high resolution grating is needed to measure kinematics.

We require 10-sigma sensitivity to the Halpha emission line at the rotation curve turnover radius (= 2.2 R_s) for our targets. Assuming an exponential

disk profile (Sersic n=1) with R_e = 1.8 kpc and average flux 1.6x10^(-17) erg/s/cm^2, the NIRSpec ETC indicates we can reach this sensitivity with 3.7 hours on-source with G235H/F170LP, or 37 minutes per dither position (where 6 out of 7 dithers are "on source" and one is compromised by bar shadows). We use the NRSIRS2 readout mode with 30 groups per integration, and 1 integration at each dither position. The total science time integration time requested is 21.3 hours, translating to 28.0 hours including overheads.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	CAT-Z25-Z36-LM9-SFR1-WEIGHTED	RA: 14 19 32.5208 (214.8855033d) Dec: +52 53 9.75 (52.88604d) Equinox: J2000		
Comments: *Description=[]*				
(2)	EGS-CAT-BROADZ-WEIGHTED	RA: 14 19 31.1750 (214.8798958d) Dec: +52 53 13.19 (52.88700d) Equinox: J2000		
Comments: *Description=[]*				
(3)	ready_pointing_fin_extraTA_3	RA: 14 19 40.8864 (214.9203600d) Dec: +52 53 49.02 (52.89695d) Equinox: J2000		
Comments: *Description=[]*				

Observation

Proposal 3426, Observation 1: pointing_fin

Tue Dec 26 17:00:38 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

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

(Visit 1:1) Warning (Form): The recommended value is 8 Reference Stars for this template.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	ready_pointing_fin_extraTA_3	RA: 14 19 40.8864 (214.9203600d) Dec: +52 53 49.02 (52.89695d) 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: F140X; Readout: NRSRAPIDD6; 7 sources in 4 quads; [Optimal TA Accuracy]	SAME	F140X	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	

Template

TA Method	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold
MSATA	No	MSA Center	pointing_fin (42 sources)		jwst-nirspec-g235h	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	117674	214.920329	52.889675	24.032969	1	526331	214.919694	52.918884	23.400790
1	120834	214.890317	52.882943	22.831473	1	527516	214.895591	52.937345	23.545949
1	127063	214.910192	52.930542	23.146549	1	528881	214.910192	52.930541	22.772669
1	129035	214.859248	52.911540	22.945464					

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)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119563419833927	-1.481	-0.429	1	2	2217.511
2	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119498208331205	-0.741	-0.429	1	2	2217.511
3	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.11943290843964		-0.429	1	2	2217.511
4	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.11936760828106	0.741	-0.429	1	2	2217.511
5	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119302395978917	1.481	-0.429	1	2	2217.511
6	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119314663547133	1.481	-0.286	1	2	2217.511
7	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119379875500698	0.741	-0.286	1	2	2217.511
8	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119445175310215		-0.286	1	2	2217.511
9	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119510474852966	-0.741	-0.286	1	2	2217.511
10	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119575686007348	-1.481	-0.286	1	2	2217.511
11	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.11958795201648	-1.481	-0.143	1	2	2217.511
12	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119522741210375	-0.741	-0.143	1	2	2217.511
13	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.11945744201649 3		-0.143	1	2	2217.511
14	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119392142555846	0.741	-0.143	1	2	2217.511

#	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)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119326930950866	1.481	-0.143	1	2	2217.511
16	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119339198190072	1.481		1	2	2217.511
17	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119404409446517	0.741		1	2	2217.511
18	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.11946970855827			1	2	2217.511
19	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119535007403414	-0.741		1	2	2217.511
20	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119600217861386	-1.481		1	2	2217.511
21	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119612483541096	-1.481	0.143	1	2	2217.511
22	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119547273432136	-0.741	0.143	1	2	2217.511
23	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119481974935724		0.143	1	2	2217.511
24	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119416676172081	0.741	0.143	1	2	2217.511
25	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119351465264785	1.481	0.143	1	2	2217.511
26	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.11936373217502	1.481	0.286	1	2	2217.511
27	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119428942734665	0.741	0.286	1	2	2217.511
28	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119494241148796		0.286	1	2	2217.511

#	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)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119559539296525	-0.741	0.286	1	2	2217.511
30	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.11962474905826	-1.481	0.286	1	2	2217.511
31	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119637014410266	-1.481	0.429	1	2	2217.511
32	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119571804996603	-0.741	0.429	1	2	2217.511
33	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119506507197514		0.429	1	2	2217.511
34	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.11944120913207	0.741	0.429	1	2	2217.511
35	1 (G235H/F170LP)	c1		214.88665766666665 Degrees 52.91441111111111 Degrees	26.119375998920827	1.481	0.429	1	2	2217.511

Special Requirements

MSA Scheduled Aperture PA 26.1463 to 26.1463 Degrees (V3 247.5717 to 247.5717)