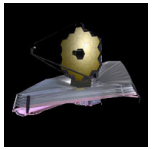

6053 - UNCOVERing the Drivers of Reionization with JWST's F410M Medium Bandpass Filter; Rest-Frame Optical Spectroscopic Properties

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	Plan1a_fin	NIRSpec MultiObject Spectroscopy	(9) msa_cat_v4
	2	Plan1b_vfin_talt	NIRSpec MultiObject Spectroscopy	(10) msa_cat_plan1b_vfin

ABSTRACT

Low-mass, star-forming galaxies have emerged as one of the most likely drivers of reionization, and their identification and study is a main goal of JWST, but the current reionization epoch JWST spectroscopic campaigns primarily focus on broadband or slitless WFSS-selected sources. An exciting alternative is to investigate JWST F410M Medium bandpass excess objects, where extreme [OIII] emitters at z~7 significantly perturb the medium band relative to the encompassing F444W broadband filter. Strong emission from doubly ionized oxygen is a beacon for some of the most intensely star-forming galaxies and for some of the highest known LyC leakage. Furthermore, the F410M bandpass selects emitters at an important redshift range z=6.72-7.59 which is thought to be a transition regime where the intergalactic medium is substantially neutral, yet there are also significant islands of ionization. We use F410M-excess selection to identify high-EWs (>500A) OIII emitters at z~7 within the UNCOVER strong lensing field, giving amplification to study intrinsically fainter galaxies. We find that only 60% of our objects are detected in extremely deep (5sigma depth of ~30 AB) JWST broadband-selected survey. Additionally, our objects are an order of magnitude fainter than found in JWST slitless WFSS

surveys, allowing us to isolate numerous – allowing for efficient MSA use – low-mass galaxies postulated to contribute significantly to reionization. In this proposal, we aim to measure the ionized gas properties including metallicity, ionization production, and AGN contribution of these z~7 low-mass, extreme emission line galaxies with NIRSpec G395M/F290LP follow-up.

OBSERVING DESCRIPTION

This MOS observing mode program uses NIRSpec's G395M/F290LP to obtain 2.87–5.10 um spectra of [OIII] emitters over a redshift of 6.72 to 7.59 with a resolving power of R=1000. We will observe rest-frame wavelengths from 3341 to 6600 A covering many lines including the [OII] doublet, [OIII]4363, HeII4686, [OI]6300, and the Balmer series out to Halpha for many targets. Our proposed program is an efficient study of strong emission sources at z~7 with a total charged time (including overheads) of 19.71 hours.

The full NIRSPEC detector is read out with NRSIRS2, as recommended for deep observations. We find through the ETC that 7 hours and 22 minutes of exposure time (using 20 groups, 6 integrations, and 3 exposures) is needed to observe [OIII]5008 at SNR>15, [OIII]4960 at SNR>5, and Hbeta at SNR>5 for our faintest source. This observational setup will give us a 3sigma detection of the Hgamma+[OIII]4363 complex for our faintest target and 5sigma detections for >2x10^-18 erg/s/cm^2 [OIII] targets, 50% of our sample.

The three exposures are used to nod, taking an exposure in each shutter of our three-shutter slitlet. We accept the trade-off of having a wavelength gap caused by the NIRSpec chip gap. We design our MSA configurations to mitigate primary emission line features falling within the gap. Adding a fixed dither to cover the chip gap would result in non-uniform SNR over the wavelength range and add multiplexing losses, due to the requirement that our sources be observable in two configurations, rather than one.

Extensive Pre-imaging with NIRCam already exists in this well-studied UNCOVER field, providing the required astrometric accuracy for target acquisition with the microshutter array. Within our APT, we demonstrate that two MSA configurations can target a total of N=23 [OIII] primary targets. A subset of four [OIII] emitters will be covered in both configurations giving us higher SNRs, and accurate relative calibration between pointings. We will use the remaining shutter space to follow up z~5 Halpha emitters, published high-z_photo UNCOVER continuum-selected sources (Weaver et al. 2023), and to form a master sky background.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(9)	msa_cat_v4	RA: 00 14 19.5362 (3.5814008d) Dec: -30 22 52.49 (-30.38125d) Equinox: J2000		
Comments: *Description=[]*				
(10)	msa_cat_plan1b_vfin	RA: 00 14 19.5362 (3.5814008d) Dec: -30 22 52.49 (-30.38125d) Equinox: J2000		
Comments: *Description=[]*				

Observation

Proposal 6053, Observation 1: Plan1a_fin Fri Sep 06 20:00:44 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(9)	msa_cat_v4	RA: 00 14 19.5362 (3.5814008d) Dec: -30 22 52.49 (-30.38125d) 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: NRSRAPIDD6; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	CLEAR	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	primary_vfin (214 sources)	filler_vfin (1370 sources)	jwst-nirspec-g395m	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	10	3.606420	-30.416576	25.245937	1	49	3.571670	-30.379686	23.791077
1	20	3.581208	-30.402046	24.769646	1	57	3.577509	-30.384791	23.363364
1	22	3.615820	-30.400983	24.390202	1	100	3.616697	-30.372148	25.386127
1	48	3.572510	-30.379270	24.782379	1	102	3.614436	-30.372924	25.344315

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 (G395M/F290LP)	c1-2_msky	3 Shutter Slitlet	3.5947454166666666 Degrees -30.392238888888 87 Degrees	187.01151273108522			3	18	26522.602

Special Requirements	MSA Scheduled Aperture PA 187.0182 to 187.0182 Degrees (V3 48.44366 to 48.44366)

Observation

Proposal 6053, Observation 2: Plan1b_vfin_talt

Fri Sep 06 20:00:44 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(10)	msa_cat_plan1b_vfin	RA: 00 14 19.5362 (3.5814008d) Dec: -30 22 52.49 (-30.38125d) 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: NRSRAPIDD6; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	CLEAR	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	pri_1b_vfin (214 sources)	fil_1b_vfin (1370 sources)	jwst-nirspec-g395m	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	32	3.562791	-30.394550	24.325354	1	76	3.598606	-30.354779	24.277712
1	37	3.590628	-30.389862	25.029130	1	78	3.604862	-30.356731	24.021672
1	55	3.597265	-30.383419	24.361995	1	79	3.598818	-30.356165	24.947702
1	63	3.546569	-30.340815	25.063373	1	83	3.602915	-30.359611	25.128837

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 (G395M/F290LP)	c1-2-msky	3 Shutter Slitlet	3.5731691666666667 Degrees -30.371261111111096 Degrees	186.47275688049282			3	18	26522.602

Special Requirements	MSA Scheduled Aperture PA 186.4686 to 186.4686 Degrees (V3 47.89405 to 47.89405)