



1827 - NIRSpec Integral Field Spectroscopy of LyC-Leaking Galaxies

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1	LACES94460_IFU	NIRSpec IFU Spectroscopy	(1) LACES94460
	2	LACES104037_IFU	NIRSpec IFU Spectroscopy	(2) LACES104037
	3	BACKGROUND_IFU	NIRSpec IFU Spectroscopy	(3) BACKGROUND

ABSTRACT

Determining the physical nature of high redshift galaxies is key to understanding whether they were responsible for cosmic reionization. A fundamental issue is the physical conditions whereby ionizing photons can escape into the intergalactic medium. While diverse observations to redshifts $z \sim 3$ have directly detected Lyman continuum (LyC) leakage from star-forming galaxies, a major puzzle is the poor correlation between the escape fraction and the ionization state of the gas inferred from nebular oxygen line ratios. Possible explanations for the scatter in this trend include the presence of clumpy internal structures of the interstellar medium, or anisotropic leakage directed through narrow channels which only

occasionally align with our line of sight. We propose NIRSpec IFU spectroscopy of a carefully-selected sample of $z=3$ compact, metal-poor Lyman alpha emitters whose intense [O III] emission and other properties makes them ideal analogs of $z>7$ systems in the reionization era. By comparing spatially-resolved diagnostic line ratios with existing HST maps of the LyC radiation, and detecting diffuse H-alpha halos sensitive to the angle-averaged escape fraction, we will examine which physical processes - massive stars, faint active galactic nuclei, radiative shocks - govern the ionizing leakage and as well as its possible anisotropy. The proposed survey will provide a valuable reference sample essential for interpreting the structure and ionizing capability of reionization-era galaxies at $z>6$ that will be soon discovered with JWST.

OBSERVING DESCRIPTION

We propose to secure NIRSpec IFU observations of two Lyman-continuum leaking galaxies at $z=3$ selected from homogeneous sample of 61 Lyman alpha emitters whose escape fractions of ionizing radiation have been carefully determined from ultra-deep HST images. Resolved spectroscopic data will be secured for key diagnostic rest-frame optical emission lines using the G235M/F170LP grating/filter combination and a single IFU pointing per target. As we aim to measure the diffuse structure around each star-forming system, accurate background subtraction and a good spatial sampling are critical. Accordingly, we adopt a nod-off-scene strategy and a small 12-point dither pattern. We will also use the NRSIRS2 readout mode to minimize spatially-correlated noise and data volume for a long exposure. Both targets are within the SSA22 enabling us to take advantage of the smart accounting mode to save slew overheads; only one dedicated background observation is necessary and can be shared for the both science targets. No target acquisition is required as HST imaging and guide stars with Gaia astrometry are available ensuring adequate initial pointing accuracy. Target coordinates are provided available from existing HST F160W images.

Proposal 1827 - Targets - NIRSpec Integral Field Spectroscopy of LyC-Leaking Galaxies

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	LACES94460	RA: 22 17 8.0270 (334.2834458d) Dec: +00 19 31.83 (.32551d) Equinox: J2000		
<i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Lyman-alpha galaxies]</i> <i>Extended=YES</i>				
(2)	LACES104037	RA: 22 17 6.7270 (334.2780292d) Dec: +00 21 33.16 (.35921d) Equinox: J2000		
<i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Lyman-alpha galaxies]</i> <i>Extended=YES</i>				
(3)	BACKGROUND	RA: 22 17 6.8300 (334.2784583d) Dec: +00 20 48.76 (.34688d) Equinox: J2000		
<i>Comments:</i> <i>Category=Calibration</i> <i>Description=[Telescope/sky background]</i>				

Fixed Targets

Proposal 1827 - Observation 1 - NIRSpec Integral Field Spectroscopy of LyC-Leaking Galaxies

Wed Mar 31 03:05:38 GMT 2021

Observation	Proposal 1827, Observation 1: LACES94460_IFU Diagnostic Status: Warning Observing Template: NIRSpec IFU 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			
	(1)	LACES94460	RA: 22 17 8.0270 (334.2834458d) Dec: +00 19 31.83 (.32551d) Equinox: J2000									
	<i>Comments:</i> Category=Galaxy Description=[Lyman-alpha galaxies] Extended=YES											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point		Number of Points	Points				
	1	CYCLING		SMALL	1		12					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	G235M/F170LP	NRSIRS2	25	1	false	true	NONE	12	12	22058.402	59524

Proposal 1827 - Observation 2 - NIRSpec Integral Field Spectroscopy of LyC-Leaking Galaxies

Wed Mar 31 03:05:38 GMT 2021

Observation	Proposal 1827, Observation 2: LACES104037_IFU Diagnostic Status: Warning Observing Template: NIRSpec IFU Spectroscopy											
	(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(2)	LACES104037	RA: 22 17 6.7270 (334.2780292d) Dec: +00 21 33.16 (.35921d) Equinox: J2000									
Comments: Category=Galaxy Description=[Lyman-alpha galaxies] Extended=YES												
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point		Number of Points		Points			
	1	CYCLING		SMALL	1		12					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	G235M/F170LP	NRSIRS2	25	1	false	true	NONE	12	12	22058.402	59524

Proposal 1827 - Observation 3 - NIRSpec Integral Field Spectroscopy of LyC-Leaking Galaxies

Wed Mar 31 03:05:38 GMT 2021

Observation	<p>Proposal 1827, Observation 3: BACKGROUND_IFU</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
Diagnostics	(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(3)	BACKGROUND	RA: 22 17 6.8300 (334.2784583d) Dec: +00 20 48.76 (.34688d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Calibration</i> <i>Description=[Telescope/sky background]</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point			Number of Points	Points			
	1	CYCLING		SMALL	1			12				
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	G235M/F170LP	NRSIRS2	25	1	false	true	NONE	12	12	22058.402	59524