



6221 - H-alpha mapping of a giant, prototypical Lyman-alpha blob at z=3

Cycle: 3, 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>
NIRSPEC_IFU				
	1	NIRSpecIFU LAB1	NIRSpec IFU Spectroscopy	(1) LAB1IFU1

ABSTRACT

Lyman-alpha blobs (LABs) are bright and extended Lyman-alpha nebulae in the early universe. LABs are suggested to be bright knots of the cosmic web filaments, where galaxy growth takes place during the active baryon cycle, such as gas fueling, feedback, and recycling. Thanks to the

brightness, therefore LABs offer an invaluable opportunity to visualize distributions and kinematics of surrounding HI gas and understand interplay with growing galaxies. However, the resonant Lyman-alpha line alone is insufficient, and on top of Lyman-alpha, a new tracer of the nebulae is required. The detection and measurement of hydrogen H-alpha flux can be a powerful tool for tracing gas originating from recombination.

In this proposal, we aim to map H-alpha and other key diagnostics lines in the giant, prototypical LAB, SSA22-LAB1 at $z = 3.1$, utilizing a four-pointing mosaic of NIRSpec-IFU. In tandem with multi-wavelength data including VLT/MUSE, Keck/KCWI, and ALMA, we will uncover (i) what is the dominant Lyman-alpha powering mechanism, (ii) what is the origin of the heating source, (iii) what is the prevalence and roles of satellite galaxies, and (iv) how metal enrichment proceed during the baryon cycle.

OBSERVING DESCRIPTION

Our target is SSA22-LAB1 at $z=3.1$, which is a giant LAB hosting dusty star-forming galaxies identified with ALMA. We propose the 4-pointing mosaic observation of NIRSpec-IFU with the G235M grism and F170LP filter to map H-alpha and other key diagnostics lines in the Lyman-alpha brightest region.

The H-alpha emission, our primal target line, is redshifted to $2.7\mu\text{m}$ at $z=3.1$. We select the combination of G235M grating and F170LP filter. This configuration enable us to observe a wavelength range of $1.66\text{--}3.07\ \mu\text{m}$ with nominal resolving power $R=1000$, and hence suitable to detect the H-alpha line with moderate spectral resolution. A set of key diagnostics line, including [O III]4363, [O III]4959, 5007, [N II], H-alpha, H-beta, will be simultaneously observed for $z=3.1$ objects. We will also consider to use them.

We do not request target acquisition observation and adopt TA method="VERIFY ONLY" since the original pointing accuracy for guide stars (about $0.1\ \text{arcsec}$) is good enough for us. The verified image will be used to check the achieved astrometry and combine the all 4-pointing data. We select 10-point CYCLING dither type with SMALL size to achieve good spatial sampling and cosmic-ray rejection. The exposures are configured with NRSIRS2 readout pattern, 23 groups, 1 integrations. This results in total exposure time of 17000s per field. We request two sets of $2\ \text{rows} \times 1\ \text{columns}$ mosaic, which will consist of 4-pointing mosaic. For each, "leakcal" exposures are planned to correct this contamination from the finite contrast MSA shutters. We do not request extra off-source pointing because background will be calculated from sufficient empty regions within the IFU FoVs.

Proposal 6221 - Targets - H-alpha mapping of a giant, prototypical Lyman-alpha blob at z=3

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1) <i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galaxies]</i>	LAB11FU1	RA: 22 17 25.9687 (334.3582029d) Dec: +00 12 38.18 (.21061d) Equinox: J2000		

Proposal 6221 - Observation 1 - H-alpha mapping of a giant, prototypical Lyman-alpha blob at z=3

Thu Sep 19 19:01:06 GMT 2024

Observation	Proposal 6221, Observation 1: NIRSpecIFU LAB1 Diagnostic Status: Warning Observing Template: NIRSpec IFU Spectroscopy											
	(NIRSpecIFU LAB1 (Obs 1)) Warning (Form): Verification imaging with an ALLOPEN MSA configuration may cause persistence from bright sources in the field of view. (NIRSpecIFU LAB1 (Obs 1)) Warning (Form): WATA may be a better choice for more accurate placement in the IFU for point-like acquisition targets with positional uncertainty of 0.1 arcsec or less. (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)	LAB1IFU1	RA: 22 17 25.9687 (334.3582029d) Dec: +00 12 38.18 (.21061d) Equinox: J2000									
<i>Comments:</i> Category=Galaxy Description=[Active galaxies]												
Template	TA Method											
	VERIFY_ONLY											
Mosaic	Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order					
	2	2	5.0	2.632	0.0	-14.21	DEFAULT					
Dithers	#	Dither Type	Size	Starting Point	Number of Points	Points						
	1	CYCLING	SMALL	1	13							
Pointing Verification	#	PV MSA Configuration	Filter	PV Readout Pattern	PV Groups/Int	PV Integrations/Exp	PV Total Dithers	PV Total Integrations	PV Total Exposure Time			
	1	ALLOPEN	CLEAR	NRSIRS2	6	1	1	1	452.256			
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	18	1	false	true	NONE	13	13	17258.657	

Proposal 6221 - Observation 1 - H-alpha mapping of a giant, prototypical Lyman-alpha blob at z=3

Special Requirements

Aperture PA Range 10 to 25 Degrees (V3 231.02835083 to 246.02835083)
Aperture PA Range 205 to 215 Degrees (V3 66.02835083 to 76.02835083)