



12267 - BLUEMOON - Benchmarking Luminous UV-Emitting Monsters Observed from Oxygen to Nitrogen: Ionizing Sources and ISM Conditions of $z=8-15$ Blue Monsters

Cycle: 5, Proposal Category: GO

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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	uds_msa_1	NIRSpec MultiObject Spectroscopy	(1) uds
	2	uds_msa_2	NIRSpec MultiObject Spectroscopy	(1) uds
	5	a2744_msa_1	NIRSpec MultiObject Spectroscopy	(3) a2744
	6	par0956p2848_msa_1	NIRSpec MultiObject Spectroscopy	(4) par0956p2848

ABSTRACT

The discovery of luminous dust-free galaxies close to cosmic dawn has been one of the biggest surprises of JWST's early science operations. The first detailed spectra suggested this population (also known as "blue monsters") may be in the midst of strong bursts, with dense and nitrogen-enriched ISM conditions that are nearly unprecedented at later epochs. However it is not clear whether these properties are representative given the small existing datasets. Fortunately, over the last year, several major JWST programs have assembled the first large spectroscopic samples of blue monsters, with redshifts ranging up to $z=14.4$. However, the prism spectra are insufficient for detailed characterization. Here we propose to obtain deep NIRSpec R=1000 rest-UV spectra of a representative sample of 10 UV-luminous galaxies between $z=8.2$ and $z=14.4$. Our galaxies are chosen to overlap with ongoing ALMA programs targeting [OIII]88 μ m, with several of our sources selected to be bright enough for absorption line spectroscopy. This program will provide a major benchmark in our understanding of the ionizing sources and ISM conditions of the blue monsters. The spectra will definitively reveal whether dense and nitrogen-enriched ionized gas is commonplace. We will characterize the range of ionizing sources present in the UV luminous systems, testing for the presence of low metallicity stars, very massive stars, and AGN. And we will place the first constraints on the presence of outflows, which may help explain the absence of dust in the blue monsters.

OBSERVING DESCRIPTION

We propose deep NIRSpec MSA observations targeting a sample of 10 UV-luminous blue monster galaxies at $z=8.2-14.4$ (see below) using G140M and G235M gratings.

We use the MSA planning tool to design MOS configurations and plan our observations. The MSA plans are set to observe our sample of 10 blue monsters. The remaining available space on the MSAs is filled with spectroscopically-confirmed galaxies at $z>4$ identified from existing NIRSpec prism spectroscopy and shallow wide-field grism spectroscopy and imaging in our fields. We will use either the G235M/F170LP grating/filter combination or G140M/F100LP + G235M/F170LP (depending on redshift) to target the rest-frame UV emission lines (NIV] to CIII]) of the primary blue monster galaxies. Meeting our science goals requires reaching a typical 3-sigma limit on the equivalent width of emission lines in the rest-frame UV of 5Å requiring a limiting line flux of $0.3-2.1 \times 10^{-18}$ erg/s/cm², with range depending on source brightness. For gratings targeting CIII], our depth is chosen to ensure detection of both components of the doublet. For gratings targeting NIV], our depth is chosen to ensure we can detect GNz11-like NIV]/CIII]+CIV flux ratios. Our science goals require a total exposure time of 75.5 hours including overheads.

We will nod in the 3-shutter slitlet for dithering, which is appropriate for our spatially compact high redshift galaxy targets. This approach has less overhead and maximizes multiplexing efficiency, compared to the fixed or flexible dithering options that require additional MSA configurations. We set up our NIRSpec exposures using NRSIRS2, which is recommended for deep observations.

COSMOS-MoM-z14, $z=14.44$, $M_{UV}=-20.2$, MSA: cosmos_msa_1;
CAPERS-UDS-z11, $z=11.01$, $M_{UV}=-20.3$, MSA: uds_msa_2;
CAPERS-UDS-z10, $z=10.56$, $M_{UV}=-20.5$, MSA: uds_msa_1;
UDS-z11-2, $z=10.80$, $M_{UV}=-20.0$, MSA: uds_msa_1;
CAPERS-COSMOS-52185, $z=9.80$, $M_{UV}=-21.8$, MSA: cosmos_msa_2;
UNCOVER-3686, $z=9.32$, $M_{UV}=-21.7$, MSA: a2744_msa_1;
UNCOVER-10646, $z=8.51$, $M_{UV}=-21.6$, MSA: a2744_msa_1;
BORG-0956+2847-1130, $z=8.49$, $M_{UV}=-20.7$, MSA: par0956p2847_msa_1;
BORG-0956+2847-169, $z=8.23$, $M_{UV}=-22.3$, MSA: par0956p2847_msa_1;
BORG-0956+2847-169-neigh, $z=8.21$, $M_{UV}=-21.5$, MSA: par0956p2847_msa_1.

Proposal 12267 - Targets - BLUEMOON - Benchmarking Luminous UV-Emitting Monsters Observed from Oxygen to Nitrogen: Ionizin...

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous	
	(1)	uds	RA: 02 17 30.2115 (34.3758812d) Dec: -05 11 58.33 (-5.19954d) Equinox: J2000			
	<i>Comments:</i> <i>Description=[]</i>					
	(3)	a2744	RA: 00 14 22.3138 (3.5929742d) Dec: -30 24 9.78 (-30.40272d) Equinox: J2000			
<i>Comments:</i> <i>Description=[]</i>						
(4)	par0956p2848	RA: 09 56 27.2424 (149.1135100d) Dec: +28 48 44.06 (28.81224d) Equinox: J2000				
<i>Comments:</i> <i>Description=[]</i>						

Proposal 12267 - Observation 1 - BLUEMOON - Benchmarking Luminous UV-Emitting Monsters Observed from Oxygen to Nitrogen: I...

Thu Apr 09 21:00:48 GMT 2026

Observation	Proposal 12267, Observation 1: uds_msa_1 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		
	(1)	uds	RA: 02 17 30.2115 (34.3758812d) Dec: -05 11 58.33 (-5.19954d) Equinox: J2000								
	<i>Comments: Description=[]</i>										
Acquisition	#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
	1		SAME	F140X	Auto Acq MSA Config	NRSRAPID	3	1	4	171.788	
Template	TA Method	HFF Readout Mode	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold			
	MSATA	false	No	MSA Center	uds (3800 sources)		mwst-nirspec-g235m	1.5			
Reference Stars											
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 (G235M/F170LP)	c1	3 Shutter Slitlet	34.430721833333 33 Degrees - 5.1278075000000 17 Degrees	39.995159223336 93			3	12	25559.735

Special Requirements

MSA Planned Aperture PA 40.0000 to 40.0000 Degrees (V3 261.4254303 to 261.4254303)

Proposal 12267 - Observation 2 - BLUEMOON - Benchmarking Luminous UV-Emitting Monsters Observed from Oxygen to Nitrogen: I...

Thu Apr 09 21:00:48 GMT 2026

Observation	Proposal 12267, Observation 2: uds_msa_2 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		
	(1)	uds	RA: 02 17 30.2115 (34.3758812d) Dec: -05 11 58.33 (-5.19954d) Equinox: J2000								
	<i>Comments: Description=[]</i>										
Acquisition	#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
	1		SAME	F140X	Auto Acq MSA Config	NRSRAPID	3	1	4	171.788	
Template	TA Method	HFF Readout Mode	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold			
	MSATA	false	No	MSA Center	uds (3800 sources)		mwst-nirspec-g235m	1.5			
Reference Stars											
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 (G235M/F170LP)	c1	3 Shutter Slitlet	34.27226975 Degrees - 5.1262474999999 77 Degrees	40.009576053985 654			3	12	27310.402

Special Requirements

MSA Planned Aperture PA 40.0000 to 40.0000 Degrees (V3 261.4254303 to 261.4254303)

Proposal 12267 - Observation 5 - BLUEMOON - Benchmarking Luminous UV-Emitting Monsters Observed from Oxygen to Nitrogen: I...

Thu Apr 09 21:00:48 GMT 2026

Observation	Proposal 12267, Observation 5: a2744_msa_1 Diagnostic Status: Warning Observing Template: NIRSpec MultiObject Spectroscopy										
Diagnostics	(a2744_msa_1 (Obs 5)) Warning (Form): Config c1 (#1) has 2 primary slits affected by failed closed shutters. (a2744_msa_1 (Obs 5)) Warning (Form): Config c1 (#2) has 2 primary slits affected by failed closed shutters. (Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous		
	(3)	a2744	RA: 00 14 22.3138 (3.5929742d) Dec: -30 24 9.78 (-30.40272d) Equinox: J2000								
	<i>Comments:</i> Description=[]										
Acquisition	#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
	1		SAME	F140X	Auto Acq MSA Config	NRSRAPID	3	1	4	171.788	
Template	TA Method	HFF Readout Mode	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold			
	MSATA	false	No	MSA Center	a2744 (4500 sources)		mwst-nirspec-mr	1.5			
Reference Stars											
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 (G140M/F100LP)	c1	3 Shutter Slitlet	3.6043312916666 665 Degrees - 30.399405833333 333 Degrees	39.994256352595			3	6	21533.202
	2	2 (G235M/F170LP)	c1	3 Shutter Slitlet	3.6043312916666 665 Degrees - 30.399405833333 333 Degrees	39.994256352595			3	6	3588.867

Special Requirements

MSA Planned Aperture PA 40.0000 to 40.0000 Degrees (V3 261.4254303 to 261.4254303)

Observation	Proposal 12267, Observation 6: par0956p2848_msa_1 Diagnostic Status: Warning Observing Template: NIRSpec MultiObject Spectroscopy										
Diagnostics	(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous		
	(4)	par0956p2848	RA: 09 56 27.2424 (149.1135100d) Dec: +28 48 44.06 (28.81224d) Equinox: J2000								
	<i>Comments: Description=[]</i>										
Acquisition	#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
	1		SAME	F140X	Auto Acq MSA Config	NRSRAPID	3	1	4	171.788	
Template	TA Method	HFF Readout Mode	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold			
	MSATA	false	No	MSA Center	par0956p2848 (4 sources)		jwst-nirspec-g140m	1.5			
Reference Stars											
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 (G140M/F100LP)	c1	3 Shutter Slitlet	149.10071554166 666 Degrees 28.794928333333 335 Degrees	49.993797344724 754			3	6	7527.867

Special Requirements

MSA Planned Aperture PA 50.0000 to 50.0000 Degrees (V3 271.4254303 to 271.4254303)