



11244 - Mapping neutral outflows in massive galaxies at $z \sim 2$

Cycle: 5, 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	COSMOS-18668	NIRSpec IFU Spectroscopy	(1) COSMOS-18668
	2	COSMOS-9871	NIRSpec IFU Spectroscopy	(2) COSMOS-9871
	3	COSMOS-11136	NIRSpec IFU Spectroscopy	(3) COSMOS-11136

ABSTRACT

Recent JWST observations have revealed strong neutral outflows, likely driven by AGN feedback, in high-redshift massive galaxies via the detection of the Na D absorption line. These observations show that the mass outflow rates are substantially larger than previously suggested by studies of the ionized phase, pointing to a key role played by outflows in quenching the star formation of massive galaxies at Cosmic Noon and beyond. However, quantitative estimates of the outflow properties still carry an order-of-magnitude uncertainty due to the unconstrained geometry -- i.e., opening angle and size -- of the neutral outflows. The only way to directly measure the geometry is to use spatially resolved observations to map the neutral gas over scales of several kpc. In this program, we will obtain spatially resolved spectroscopy for three carefully selected galaxies at $z \sim 2$ which are massive ($M_{\text{star}} > 10^{11} M_{\text{sun}}$) and on the brink of quenching their star formation. Archival NIRSpec/MSA spectra unambiguously show the presence of neutral outflows in the targets; by obtaining NIRSpec/IFU observations we will be able to map the neutral (and, possibly, ionized) outflow and measure its size and opening angle. Since these targets are an unbiased sampling of the massive population hosting strong neutral outflows, the geometry we measure in this work will be applicable to larger samples of galaxies with spatially unresolved spectroscopy. Ultimately, our results will enable a robust assessment of the total mass and energy budget for galaxy-wide outflows, leading to conclusively establish the relation between outflows, AGN feedback, and galaxy quenching.

OBSERVING DESCRIPTION

Three galaxies at $z \sim 2$ are observed with the NIRSpec IFU using the G235M grating, with the goal of mapping the Na D absorption line and the H α and [N II] emission lines. We choose the small dithering cycle so that the galaxies, which are 1-2 arcsec across, are always within the IFU field of view. A sufficient number of empty spaxels are present in each exposure, so that a master background spectrum can be derived. Since the JWST blind pointing accuracy of 0.1 arcsec is more than sufficient for our observations, Target Acquisition is not needed.

Proposal 11244 - Targets - Mapping neutral outflows in massive galaxies at z~2

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	COSMOS-18668	RA: 10 00 31.0252 (150.1292717d) Dec: +02 22 10.43 (2.36956d) Equinox: J2000		
<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei, Disk galaxies, High-redshift galaxies]</i> <i>Extended=YES</i></p>				
(2)	COSMOS-9871	RA: 10 00 18.6716 (150.0777983d) Dec: +02 16 52.09 (2.28114d) Equinox: J2000		
<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei, Disk galaxies, High-redshift galaxies]</i> <i>Extended=YES</i></p>				
(3)	COSMOS-11136	RA: 10 00 26.1715 (150.1090479d) Dec: +02 17 39.58 (2.29433d) Equinox: J2000		
<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei, Disk galaxies, High-redshift galaxies]</i> <i>Extended=YES</i></p>				

Fixed Targets

Proposal 11244 - Observation 1 - Mapping neutral outflows in massive galaxies at z~2

Fri Mar 13 21:03:09 GMT 2026

Observation	<p>Proposal 11244, Observation 1: COSMOS-18668</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
	<p>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>											
Diagnosics												
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(1)	COSMOS-18668	RA: 10 00 31.0252 (150.1292717d) Dec: +02 22 10.43 (2.36956d) Equinox: J2000									
<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei, Disk galaxies, High-redshift galaxies]</i> <i>Extended=YES</i></p>												
Template	TA Method					HFF Readout Mode						
	NONE					false						
Dithers	#	Dither Type		Size	Starting Point		Number of Points		Points			
	1	CYCLING		SMALL	1		14					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	G235M/F170LP	NRSIRS2	20	1	false	true	NONE	14	14	20628.69	

Proposal 11244 - Observation 2 - Mapping neutral outflows in massive galaxies at z~2

Fri Mar 13 21:03:09 GMT 2026

Observation	<p>Proposal 11244, Observation 2: COSMOS-9871</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
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			
	(2)	COSMOS-9871	RA: 10 00 18.6716 (150.0777983d) Dec: +02 16 52.09 (2.28114d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei, Disk galaxies, High-redshift galaxies]</i> <i>Extended=YES</i></p>											
Template	TA Method					HFF Readout Mode						
	NONE					false						
Dithers	#	Dither Type		Size	Starting Point		Number of Points		Points			
	1	CYCLING		SMALL	1		10					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	G235M/F170LP	NRSIRS2	20	1	false	true	NONE	10	10	14734.779	

Proposal 11244 - Observation 3 - Mapping neutral outflows in massive galaxies at z~2

Fri Mar 13 21:03:09 GMT 2026

Observation	<p>Proposal 11244, Observation 3: COSMOS-11136</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)	COSMOS-11136	RA: 10 00 26.1715 (150.1090479d) Dec: +02 17 39.58 (2.29433d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei, Disk galaxies, High-redshift galaxies]</i> <i>Extended=YES</i></p>											
Template	TA Method					HFF Readout Mode						
	NONE					false						
Dithers	#	Dither Type		Size	Starting Point		Number of Points		Points			
	1	CYCLING		SMALL	1		10					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	G235M/F170LP	NRSIRS2	20	1	false	true	NONE	10	10	14734.779	