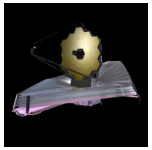

3659 - What quenched the first massive quiescent galaxy? A comprehensive analysis from stellar kinematics to gas emission lines

Cycle: 2, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	GS-9209 - G235H/F170LP - R2700	NIRSpec IFU Spectroscopy	(1) GS-9209
	2	GS-9209 - G395H/F290LP - R2700	NIRSpec IFU Spectroscopy	(1) GS-9209

ABSTRACT

Most models expect that the most massive central galaxies are quenched by Active Galactic Nuclei (AGN) feedback, yet how this quenching happens is yet to be understood. This question is critical not only to our understanding of galaxy formation/evolution, but also for the physics of the baryon cycle and of AGNs themselves. The discovery of massive quiescent galaxies at high redshift poses stringent time constraints on feedback mechanisms.

As the redshift frontier moves to higher redshifts, the available time interval between look-back time and quenching becomes necessarily shorter, leaving ever less room for subsequent, confounding evolution. At a redshift z = 4.658, GS-9209 is the highest-redshift, massive quiescent galaxy

observed to date, hence it represents the best case study to investigate how these systems quenched in the young, gas-rich Universe. This expectation is confirmed by a recent, very high S/N NIRSpec spectrum of the galaxy, confirming its quiescence and a spectacular broad-line H— unmistakable evidence for ongoing gas accretion onto supermassive black hole (AGN activity). We propose to investigate the spatially resolved stellar and emission-line properties of GS-9209 to search for the distinctive signatures of the mechanism that has recently quenched this galaxy.

OBSERVING DESCRIPTION

We propose deep NIRSpec/IFU observations of a single, high-value target at z=4.7.

The target is a compact source (half-light radius 0.04 arcsec), so no target acquisition is required.

Two observations are required:
- a high-resolution observation (G235H/F170LP), total exposure time 14.5 h
- a low-resolution observation (G395H/F290LP), total exposure time 4 h

The adopted medium-size (0.5") cycling dither pattern was selected as a compromise between accurate sampling of the point spread function and the need to offset failed-open shutters from NIRSpec/MSA.

No dedicated background exposures are required, because the IFU field of view contains sufficient empty regions for the background subtraction.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GS-9209	RA: 03 32 25.9600 (53.1081667d)	Proper Motion RA: 0. mas/yr	
		Dec: -27 49 30.44 (-27.82512d)	Proper Motion Dec: 0. mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: F277W = 22.8 AB mag
Re(F277W) = 0.04 arcsec
Category=Galaxy
Description=[Compact galaxies, Giant galaxies, High-redshift galaxies]
Extended=YES

Observation

Proposal 3659, Observation 1: GS-9209 - G235H/F170LP - R2700 Thu Sep 07 22:00:50 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: We have restricted the PA range to avoid possible MSA leakage by bright stars. The range is to be interpreted as (0<V3<58) or (320<V3<360). Note the different PA range for the PRISM/CLEAR configuration.

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)	GS-9209	RA: 03 32 25.9600 (53.1081667d)	Proper Motion RA: 0. mas/yr	
		Dec: -27 49 30.44 (-27.82512d)	Proper Motion Dec: 0. mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: F277W = 22.8 AB mag
Re(F277W) = 0.04 arcsec
Category=Galaxy
Description=[Compact galaxies, Giant galaxies, High-redshift galaxies]
Extended=YES

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	MEDIUM	1	9	

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	G235H/F170LP	NRSIRS2	20	2	false	true	NONE	9	18	26522.602	135543.15
2	G235H/F170LP	NRSIRS2	20	2	false	true	NONE	9	18	26522.602	135543.15

Special Requirements

Aperture PA Range 98.97253418 to 196.97253418 Degrees (V3 320.0 to 58.0)

Observation

Proposal 3659, Observation 2: GS-9209 - G395H/F290LP - R2700 Thu Sep 07 22:00:50 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: We have restricted the PA range to avoid possible MSA leakage by bright stars. The range is to be interpreted as (0<V3<58) or (325<V3<360).

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)	GS-9209	RA: 03 32 25.9600 (53.1081667d)	Proper Motion RA: 0. mas/yr	
		Dec: -27 49 30.44 (-27.82512d)	Proper Motion Dec: 0. mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: F277W = 22.8 AB mag
Re(F277W) = 0.04 arcsec
Category=Galaxy
Description=[Compact galaxies, Giant galaxies, High-redshift galaxies]
Extended=YES

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	MEDIUM	1	10	

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	G395H/F290LP	NRSIRS2	20	1	false	true	NONE	10	10	14734.779	135543.12

Special Requirements

Aperture PA Range 98.97253418 to 196.97253418 Degrees (V3 320.0 to 58.0)