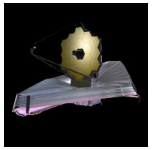

4318 - Is there Evidence of alpha-Enhancement in Massive Quiescent Galaxies at z > 3?

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	100	plan600	NIRSpec MultiObject Spectroscopy	(11) go4318_target_v9s

ABSTRACT

We propose NIRSpec MOS spectroscopy of three massive quiescent galaxies at 3< z< 5. We have confirmed their quiescent nature and redshifts via the detection of Balmer absorption lines in deep Keck/MOSFIRE spectroscopy. Our robust sample selection and analysis reveals that two them are

uncomfortably massive (log M/M_sun>11), placing them in tension with predictions from LCDM. The missing piece in resolving this tension is a direct observational constraint on their formation timescales and hence stellar mass assembly histories via fossil records imprinted in their stellar populations (i.e. their [alpha/Fe] ratios). The largest factor limiting progress on this front is the lack of high SNR spectroscopic data with continuous wavelength coverage (1.6-5.3 microns) that includes these key features. This is a Herculean task to attempt from the ground, where atmospheric absorption and emission make continuum observations far more challenging, thereby requiring 50+ hours on the most sensitive ground-based spectrographs to make marginally constraining measurements of elemental ratios. In this proposal, we demonstrate that we achieve the requisite SNR for all our candidates with only 8 hours of JWST/NIRSpec time enabling us to constrain [alpha/Fe] to within 0.12 dex. This will allow us to trace stellar population properties as close to their formation epoch as possible and make practical recommendations for stellar population synthesis codes and cosmological simulations, which will address this tension with theory. Our modest proposal is a proof of concept that this transformative science can only be done at these early epochs with JWST and will motivate future, deeper observations.

OBSERVING DESCRIPTION

We propose to use JWST/NIRSpec in the MSA mode to obtain continuous wavelength coverage of 3 massive quiescent galaxy candidates at $3 < z < 5$ selected in the COSMOS field. The goals of this program are: 1) Confirming the detection of Balmer absorption lines in our faintest (Ks ~ 24) quiescent candidates at z = 3.33 and z = 4.67. 2) Making the first measurement of [alpha/Fe] for this population to better constrain their ages and formation timescales. 3) Constraining the redshifts for ~ 45 filler targets including extreme emission line galaxies at $2 < z < 5.5$ and massive star forming galaxies at z ~ 3-4. At these redshifts z>3, several of the age and abundance features of interest lie at > 2.5 microns in the observed frame, hence are only observable with JWST. We propose to observe our targets with the medium resolution (R= 1000) G235M/F170LP and G395/F290LP gratings. This grism/filter combination provides the best wavelength coverage and resolution required to obtain the elemental abundances of z ~ 3-5 galaxies. 50-83 groups with 3 exposures with NRSIRS2 (recommended for faint targets) yields SNR \sim 6 - 50 per pixel at 1.5 - 3 microns. Therefore, our program requires ~ 11,000s (~3 hours) in the G235M grating and ~ 18206s (~ 5 hours) in the G395M grating to achieve the desired SNR.

Proposal 4318 - Targets - Is there Evidence of alpha-Enhancement in Massive Quiescent Galaxies at z > 3?

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(11)	go4318_target_v9s	RA: 10 01 49.7358 (150.4572325d) Dec: +02 27 4.45 (2.45124d) Equinox: J2000		

Comments:
Description=[]

Observation

Proposal 4318, Observation 100: plan600

Wed Mar 20 19:01:42 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

(Visit 100:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(11)	go4318_target_v9s	RA: 10 01 49.7358 (150.4572325d) Dec: +02 27 4.45 (2.45124d) Equinox: J2000		

Comments:
Description=[]

Acquisition

#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	Filter: F110W; Readout: NRSRAPIDD6; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	F110W	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	

Template

TA Method	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold
MSATA	No	MSA Center	main_v9 (4 sources)	filler_v9 (1472 sources)	jwst-nirspec-mr	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	3847	150.491349	2.431153	23.721150106057586	1	8389	150.458521	2.427165	22.699032824031768
1	5187	150.487960	2.445000	23.055763731631643	1	8646	150.476253	2.473200	23.878571446972916
1	7602	150.464994	2.430618	23.2340857347291	1	11313	150.446466	2.447798	22.67135549877699
1	7659	150.482358	2.471450	22.38411947352464	1	12141	150.445477	2.458537	22.360783744045758

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	150.46546875 Degrees 2.4507694444444446 Degrees	246.98864760109336			3	6	10591.534
2	2 (G395M/F290LP)	c1	3 Shutter Slitlet	150.46546875 Degrees 2.4507694444444446 Degrees	246.98864760109336			3	12	18557.068

Special Requirements	MSA Scheduled Aperture PA 246.9883 to 246.9883 Degrees (V3 108.413704 to 108.413704)