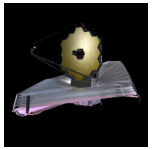

10341 - LUCID: Unveiling Galaxies Below the 1% Solar Metallicity Floor through Cosmic Telescopes

Cycle: 5, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
NIRSpec MSA				
	1	rxj1347_plan1	NIRSpec MultiObject Spectroscopy	(1) rxj1347_1347m1145_msa
	2	a2744_plan1	NIRSpec MultiObject Spectroscopy	(2) abell2744_1408m3023_msa
	3	a370_plan1	NIRSpec MultiObject Spectroscopy	(3) abell0370_0240m0135_msa
	4	macs0416_plan1	NIRSpec MultiObject Spectroscopy	(4) macs0416_0417m2406_msa

ABSTRACT

One of the yet unfulfilled JWST goals is to find pristine stellar populations. Some of the most metal-poor objects known to date have been found serendipitously in lensing clusters at relatively low redshift (z<6), often exhibiting strong Lyman-alpha emission. To better understand their nature and significance of this class of extremely low-mass systems, and to possibly identify even lower metallicity or truly pristine galaxies, we propose deep spectroscopy using NIRSpec MSA G235M/F170LP. From 4 exceptional lensing clusters with deep MUSE and HST+JWST imaging coverage,

~100 intrinsically faint Lyman-alpha emitters (LAEs) at 3<z<6 are selected as the primary targets. Our main goal is to measure, or place stringent limits on, the [OIII]/Hbeta ratio, which is an effective indicator of gas-phase metallicity, for these intrinsically faint (-MUV=18-14) LAEs. Extreme objects with hard ionization spectra will be identified where the Lyman-alpha/Hbeta ratio approaches the theoretical limit for a canonical initial mass function. For objects with detectable metal lines, we will investigate potential abundance anomalies in carbon, nitrogen, argon and other elements. Beyond providing critical insight into the most metal-poor galaxies, this survey will extend the mass-metallicity relation to lower masses and verify whether the scatter increases, as hinted by current sparse data. Non-LAE sources will be included as mask fillters.

OBSERVING DESCRIPTION

Observational Setup:

The primary goal is to cover the wavelength range of Hbeta and [Oiii] of our sample Ly-alpha emitters at 3<z<6. For this, we have chosen NIRSpec MSA with the G235M/F170LP grating setup.

With the default pipeline setup, the grating offers wavelength coverage at ~1.66–3.07 um, whereas the instrument itself does cover longer wavelengths. We will use a publicly available reduction pipeline, msaexp, which recently explored the way to use the remaining wavelength, increasing the usable wavelength all the way up to ~4um. This enables the Hbeta+[O iii] wavelength coverage up to z~6 (as opposed to z<5.3 from the default pipeline), which is approximately the maximum redshift of our sample, only with the single grating. This has enabled us to request only half the observing time that would have been needed previously. Note that the spectral range that physically falls off of the detector cannot be recovered. As such, we have designed the pointing coordinates and position angle so many of our high priority objects at z>5.3 fall within the detector quadrants Q3 or Q4.

[Exposure time]

We have configured a deep, 11.7 hr on-source exposure,
to reach the line sensitivity ~1.1x10-19 erg/s/cm2 at 2sigma (100 km/s line width, FWHM).

[Pre-imaging]

Since all target fields were previously observed with NIRCam, and our MSA source catalog is constructed using the NIRCam imaging, we will skip pre-imaging. Including overhead, we request 15.5 hrs each field, totaling 61.9 hrs for the whole program.

[Special requirement]

For the reason described above, we would need a specific pointing at a specific angle, to maximize the sample coverage with Hb+Oiii effectively covered with G235M. We thus request the following dispersion PA constraints for our target fields:

- rxj1347: PA=70.0degree +/- 15degree
- a2744: PA=180.0degree +/- 15degree
- a370: PA=45.0degree +/- 15degree
- macs0416: PA=210.0degree +/- 15degree

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	rxj1347_1347m1145_msa	RA: 13 47 31.5096 (206.8812900d) Dec: -11 45 1.38 (-11.75038d) Equinox: J2000		
Comments: *Description=[]*				
(2)	abell2744_1408m3023_msa	RA: 00 14 17.9926 (3.5749692d) Dec: -30 23 22.66 (-30.38963d) Equinox: J2000		
Comments: *Description=[]*				
(3)	abell0370_0240m0135_msa	RA: 02 39 56.0477 (39.9835321d) Dec: -01 35 13.61 (-1.58711d) Equinox: J2000		
Comments: *Description=[]*				
(4)	macs0416_0417m2406_msa	RA: 04 16 10.7868 (64.0449450d) Dec: -24 05 36.17 (-24.09338d) Equinox: J2000		
Comments: *Description=[]*				

Observation

Proposal 10341, Observation 1: rxj1347_plan1

Fri Mar 13 19:06:13 GMT 2026

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)	rxj1347_1347m1145_msa	RA: 13 47 31.5096 (206.8812900d) Dec: -11 45 1.38 (-11.75038d) Equinox: J2000		

Comments:
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	rxj1347_1347m1145_msa (3254 sources)	rxj1347_1347m1145_msa (3254 sources)	jwst-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	206.87790891666666 Degrees -11.742577499999982 Degrees	70.00070121977998			3	24	21358.135
2	1 (G235M/F170LP)	c1	3 Shutter Slitlet	206.87790891666666 Degrees -11.742577499999982 Degrees	70.00070121977998			3	24	21358.135

Special Requirements	
	Aperture PA Range 55 to 85 Degrees (V3 276.4254303 to 306.4254303) MSA Planned Aperture PA 70.0000 to 70.0000 Degrees (V3 291.4254303 to 291.4254303)

Observation

Proposal 10341, Observation 2: a2744_plan1

Fri Mar 13 19:06:13 GMT 2026

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
(2)	abell2744_1408m3023_msa	RA: 00 14 17.9926 (3.5749692d) Dec: -30 23 22.66 (-30.38963d) Equinox: J2000		

Comments:
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	abell2744_1408m3023_msa (24494 sources)	abell2744_1408m3023_msa (24494 sources)	jwst-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	3.4902075833333335 Degrees -30.33463333333333 Degrees	180.04266022831482			3	24	21358.135
2	1 (G235M/F170LP)	c1	3 Shutter Slitlet	3.4902075833333335 Degrees -30.33463333333333 Degrees	180.04266022831482			3	24	21358.135

Special Requirements	
	Aperture PA Range 165 to 195 Degrees (V3 26.4254303 to 56.4254303) MSA Planned Aperture PA 180.0000 to 180.0000 Degrees (V3 41.4254303 to 41.4254303)

Observation

Proposal 10341, Observation 3: a370_plan1

Fri Mar 13 19:06:13 GMT 2026

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

(a370_plan1 (Obs 3)) Warning (Form): Config c1 (#1) has 2 primary slits affected by failed closed shutters.

(a370_plan1 (Obs 3)) Warning (Form): Config c1 (#2) has 2 primary slits affected by failed closed shutters.

(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)	abell0370_0240m0135_msa	RA: 02 39 56.0477 (39.9835321d) Dec: -01 35 13.61 (-1.58711d) Equinox: J2000		

Comments:
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	abell0370_0240m0135_msa (11980 sources)	abell0370_0240m0135_msa (11980 sources)	jwst-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	39.974391291666 66 Degrees -1.5734158333333 426 Degrees	45.000282678999 675			3	24	21358.135
2	1 (G235M/F170LP)	c1	3 Shutter Slitlet	39.974391291666 66 Degrees -1.5734158333333 426 Degrees	45.000282678999 675			3	24	21358.135

Special Requirements	
	Aperture PA Range 30 to 60 Degrees (V3 251.42543030000002 to 281.4254303) MSA Planned Aperture PA 45.0000 to 45.0000 Degrees (V3 266.4254303 to 266.4254303)

Observation

Proposal 10341, Observation 4: macs0416_plan1

Fri Mar 13 19:06:13 GMT 2026

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	macs0416_0417m2406_msa	RA: 04 16 10.7868 (64.0449450d) Dec: -24 05 36.17 (-24.09338d) Equinox: J2000		

Comments:
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	macs0416_0417m2406_msa (3809 sources)	macs0416_0417m2406_msa (3809 sources)	jwst-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	64.025985041666 66 Degrees -24.079071944444 422 Degrees	210.00770012131 51			3	24	21358.135
2	1 (G235M/F170LP)	c1	3 Shutter Slitlet	64.025985041666 66 Degrees -24.079071944444 422 Degrees	210.00770012131 51			3	24	21358.135

Special Requirements	
	Aperture PA Range 195 to 225 Degrees (V3 56.4254303 to 86.4254303) MSA Planned Aperture PA 210.0000 to 210.0000 Degrees (V3 71.4254303 to 71.4254303)