



1199 - The metallicity of galaxies in the MACS J1149.5+2223 field

Cycle: 1, Proposal Category: GTO

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. Massimo Stiavelli (PI)	Space Telescope Science Institute
Dr. Takahiro Morishita (CoI)	California Institute of Technology

OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
MSA G235M Final				
	20	v16-G235M-1	NIRSpec MultiObject Spectroscopy	(14) v16
	22	v16-G235M-2	NIRSpec MultiObject Spectroscopy	(14) v16
MSA G395M Final				
	21	v16-G395M-1	NIRSpec MultiObject Spectroscopy	(14) v16
	23	v16-G395M-2	NIRSpec MultiObject Spectroscopy	(14) v16
Primary Imaging				
	5	NIRCam Imaging	NIRCam Imaging	(1) MACS-J1149.6+2223

ABSTRACT

The overall goal of this investigation is to study the formation and evolution of early type galaxies and their relation to their star forming progenitors. This is accomplished by obtaining NIRCam imaging data and NIRSpec multiobject MSA spectroscopy of a sample of both early and late type galaxies to determine their metallicity and, when possible, metal abundance ratios and correlate them with other global galaxy properties. The target field will be the Frontier Fields cluster MACS 1149.5+2223, and specifically our primary targets are MACS1149-JD1, a confirmed galaxy at $z=9.1$, and other star forming/passively evolving galaxies at $z>3$.

The coordinated parallels for this program, deep NIRCam imaging of partly overlapping the HFF parallel field, will have no exclusive access period.

OBSERVING DESCRIPTION

The technical goals of this program are 1. to cover MACS1149-JD1, a confirmed galaxy at $z=9.1$, and get very deep spectra over the full range of two NIRSPEC gratings (G235M and G395M; none of wavelength range should fall the detector gap), 2. to cover the parallel field of the Hubble Frontier Fields of this cluster, and 3. to get as many spectra as possible of early and late type galaxies in other MSA shutters.

We use two medium resolution gratings of NIRSPEC: G235M and G395M. This combination allows us to measure rest frame UV to Oiii5007 lines for JD1, and Mg2 5275 and Halpha for galaxies in the redshift range 3 to 6. We will also measure [OII], [OIII], CaHK, Hbeta in the redshift range 3.5 to 9.

We plan to use 4 different MSA configurations, 2 for each grating. For some objects we will use both gratings while for others just one. The decision will be made on the basis of the available photometric redshifts of the objects. Aside from optimization of the number of MSA targets we will also attempt to balance the number of late and early type objects.

We will exploit the benefits of gravitational amplification from the lensing cluster whenever possible. If some slitlets remain without a target we will open them on available galaxies or on empty sky.

[Update: Apr1 2020]: The NIRCAM primary and parallel filters are updated so they will provide sufficient SED sampling both for Lyman break galaxies at $z>6$ and passive galaxies at $z>3$.

This version has a position angle that should produce partial overlap with the FF HST parallel field. If the coordinated parallels overhead is too high we will drop the PA constraint and go without parallels. The MSA target selection may need to be finalized after launch (as it will require careful astrometric calibration). The Primary NIRCAM pointing and the position angle to better overlap the NIRCAM parallel could both need some tweaks.

[Update: Dec1 2021]:

The NIRCAM primary and parallel filters are updated following the reviewers comments;

NIRCAM parallel imaging (Obs 20,21,22,23):

- By following the reviewer's comments, we updated the readout pattern and group number, from `DEEP2 with 9 groups` to `MEDIUM 8 with 10 groups`. We confirm that those changes improve SNs for all observations (e.g., 6.6% increase in F200W). Those changes did not increase the total

exposure time.

NIRCam primary imaging (Obs 5):

- Following the comments, we updated the readout pattern and group number, from `Deep 2 + 6 Groups + 1 integration` to `Medium 8 + 5 Groups + 2 integration`, to achieve comparable depth. This slightly improved SNs (~0.1%).

All changes above resulted in 32.52hr total time, which is less than what was previously allocated, 32.6hr. The total data increased due to the changes above (from 65371.50MB to 96163.89MB) but no warning is raised.

PA constraint in NIRCam primary imaging (Obs 5):

- We also followed up one of the suggestions made by a previous reviewer on 4/1/20, about our PA constraint in NIRCam primary imaging. We reached that we do not need this constraint. Removing this constraint will increase the observable window of the target. Noted that we will still need final adjustment of the pointing once PA is assigned, to make sure that 1. our primary target (JD1) is within the deepest part of the NIRCam imaging and 2. we maximize the overlap between NIRCam imaging and the existing HST imaging (HFF's cluster center).

NIRSpec source catalog:

- We uploaded a new version of the source catalog in APT, which reflects updates in the coordinate system of the sources to a newly released GAIA-DR2 WCS. We did not run NIRSPEC MSA planner this time (but just leave the previous ones), as it needs a PA assigned to finalize the MSA mask. The primary target of this program, MACS1149-JD1, is now registered as ID=1006 in the newly uploaded catalog.

This includes GTO submission IDs: STIAVELLI_0001 through 0010.

Proposal 1199 - Targets - The metallicity of galaxies in the MACS J1149.5+2223 field

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	MACS-J1149.6+2223	RA: 11 49 33.5779 (177.3899079d) Dec: +22 24 45.76 (22.41271d) Equinox: J2000 <i>Comments: The target coordinate is set to JD1. Special constraints ("offset") added to the NIRCcam primary imaging will bring the deepest region on JD1.</i> <i>Category=Galaxy</i> <i>Description=[Elliptical galaxies, Emission line galaxies, Field galaxies, High-redshift galaxies]</i>		
(14)	v16	RA: 11 49 35.6253 (177.3984387d) Dec: +22 23 58.35 (22.39954d) Equinox: J2000 <i>Comments:</i> <i>Description=[]</i>			

Proposal 1199 - Observation 20 - The metallicity of galaxies in the MACS J1149.5+2223 field

Mon Mar 20 16:00:42 GMT 2023

Observation	Proposal 1199, Observation 20: v16-G235M-1 Diagnostic Status: Warning Observing Template: NIRSpec MultiObject Spectroscopy Coordinated Parallel Template(s): NIRCam Imaging																																																												
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Proposal 1199 - Observation 20 - The metallicity of galaxies in the MACS J1149.5+2223 field

Spectral Elements	NIRSpec	Exposure	MSA	Nod Pattern	Pointing	Aperture PA	Dispersion Offset	Cross-Dispersion	Total Dithers	Total	Total Exposure
	MultiObject Spectroscopy	Specification	Configuration				(Shutters)	Offset (Shutters)		Integrations	Time
1		1 (G235M/F170LP)	c1-manual	3 Shutter Slitlet	177.40898408333 33 Degrees 22.391519444444 445 Degrees	257.76607231266 38			3	12	16806.401
Spectral Elements	NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure	ETC Wkbk.Calc	
									Time	ID	
1		F200W	F277W	MEDIUM8	10	5	15	3	15911.893		
Special Requirements	No Parallel Attachments MSA Scheduled Aperture PA 257.7620497 to 257.7620497 Degrees (V3 119.18748 to 119.18748)										

Proposal 1199 - Observation 22 - The metallicity of galaxies in the MACS J1149.5+2223 field

Mon Mar 20 16:00:42 GMT 2023

Observation	Proposal 1199, Observation 22: v16-G235M-2 Diagnostic Status: Warning Observing Template: NIRSpec MultiObject Spectroscopy Coordinated Parallel Template(s): NIRCam Imaging										
	(Visit 22:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous		
	(14)	v16	RA: 11 49 35.6253 (177.3984387d) Dec: +22 23 58.35 (22.39954d) Equinox: J2000								
<i>Comments: Description=[]</i>											
Acquisition	NIRSpec MultiObject Spectroscopy	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	Filter: F140X; Readout: NRSRAPID; 8 sources in 3 quads; [Optimal TA Accuracy]	SAME	F140X	Auto Acq MSA Config	NRSRAPID	3	1	4	171.788	
Template	NIRSpec MultiObject Spectroscopy					NIRCam Imaging					
	TA Method: MSATA Obtain Confirmation Images: No Science Aperture: MSA Center Primary Candidate List: primary16 (538 sources) Filler Candidate List: filler16 (2758 sources) Spectral Overlap Map: jwst-nirspec-g235m Spectral Overlap Threshold: 1.5					Module: ALL Subarray: FULL Target Placement: Module Gap					
Reference Stars	Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude	
	1	320016	177.400742	22.396248	21.82	1	320069	177.384827	22.398850	21.69	
	1	320048	177.418121	22.407375	22.28	1	320070	177.401672	22.398804	21.84	
	1	320049	177.382919	22.406941	21.92	1	320090	177.392838	22.418198	21.83	
	1	320066	177.392120	22.401283	21.87	1	320116	177.394653	22.378630	21.36	
Dithers	#	Dither Type									
	1	NONE									

Proposal 1199 - Observation 22 - The metallicity of galaxies in the MACS J1149.5+2223 field

Spectral Elements	NIRSpec	Exposure	MSA	Nod Pattern	Pointing	Aperture PA	Dispersion Offset	Cross-Dispersion	Total Dithers	Total	Total Exposure
	MultiObject Spectroscopy	Specification	Configuration				(Shutters)	Offset (Shutters)		Integrations	Time
1		1 (G235M/F170LP)	c1-manual	3 Shutter Slitlet	177.41035374999 998 Degrees 22.391830555555 554 Degrees	259.66954127525 236			3	12	16806.401
Spectral Elements	NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure	ETC Wkbk.Calc	
									Time	ID	
1		F150W	F356W	MEDIUM8	10	5	15	3	15911.893		
Special Requirements	No Parallel Attachments MSA Scheduled Aperture PA 259.6649997 to 259.6649997 Degrees (V3 121.09043 to 121.09043)										

Proposal 1199 - Observation 21 - The metallicity of galaxies in the MACS J1149.5+2223 field

Mon Mar 20 16:00:42 GMT 2023

Observation	Proposal 1199, Observation 21: v16-G395M-1 Diagnostic Status: Warning Observing Template: NIRSpec MultiObject Spectroscopy Coordinated Parallel Template(s): NIRCam Imaging										
	(Visit 21:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous		
	(14)	v16	RA: 11 49 35.6253 (177.3984387d) Dec: +22 23 58.35 (22.39954d) Equinox: J2000								
<i>Comments: Description=[]</i>											
Acquisition	NIRSpec MultiObject Spectroscopy	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	Filter: F140X; Readout: NRSRAPID; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	F140X	Auto Acq MSA Config	NRSRAPID	3	1	4	171.788	
Template	NIRSpec MultiObject Spectroscopy					NIRCam Imaging					
	TA Method: MSATA Obtain Confirmation Images: No Science Aperture: MSA Center Primary Candidate List: v16 (3296 sources) Filler Candidate List: filler16 (2758 sources) Spectral Overlap Map: jwst-nirspec-g395m Spectral Overlap Threshold: 1.5					Module: ALL Subarray: FULL Target Placement: Module Gap					
Reference Stars	Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude	
	1	320014	177.398560	22.398081	21.53	1	320069	177.384827	22.398850	21.69	
	1	320016	177.400742	22.396248	21.82	1	320079	177.372665	22.413160	21.43	
	1	320039	177.400360	22.398211	21.72	1	320110	177.423218	22.382765	21.64	
	1	320048	177.418121	22.407375	22.28	1	320116	177.394653	22.378630	21.36	
Dithers	#	Dither Type									
	1	NONE									

Proposal 1199 - Observation 21 - The metallicity of galaxies in the MACS J1149.5+2223 field

Spectral Elements	NIRSpec	Exposure	MSA	Nod Pattern	Pointing	Aperture PA	Dispersion Offset	Cross-Dispersion	Total Dithers	Total	Total Exposure
	MultiObject Spectroscopy	Specification	Configuration				(Shutters)	Offset (Shutters)		Integrations	Time
1		1 (G395M/F290LP)	c1-manual	3 Shutter Slitlet	177.40897820833 334 Degrees 22.391518333333 334 Degrees	257.76607008203 166			3	12	16806.401
Spectral Elements	NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure	ETC Wkbk.Calc	
									Time	ID	
1		F090W	F410M	MEDIUM8	10	5	15	3	15911.893		
Special Requirements	No Parallel Attachments MSA Scheduled Aperture PA 257.7620497 to 257.7620497 Degrees (V3 119.18748 to 119.18748)										

Proposal 1199 - Observation 23 - The metallicity of galaxies in the MACS J1149.5+2223 field

Mon Mar 20 16:00:42 GMT 2023

Observation	<p>Proposal 1199, Observation 23: v16-G395M-2</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec MultiObject Spectroscopy</p> <p>Coordinated Parallel Template(s): NIRCam Imaging</p>																																																												
	<p>(Visit 23:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																																																												
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Proposal 1199 - Observation 23 - The metallicity of galaxies in the MACS J1149.5+2223 field

Spectral Elements	NIRSpec	Exposure	MSA	Nod Pattern	Pointing	Aperture PA	Dispersion Offset	Cross-Dispersion	Total Dithers	Total	Total Exposure
	MultiObject Spectroscopy	Specification	Configuration				(Shutters)	Offset (Shutters)		Integrations	Time
1		1 (G395M/F290LP)	c1-manual	3 Shutter Slitlet	177.41020916666 665 Degrees 22.391916666666 667 Degrees	256.76653765418 54			3	12	16806.401
Spectral Elements	NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure	ETC Wkbk.Calc	
									Time	ID	
1		F115W	F444W	MEDIUM8	10	5	15	3	15911.893		
Special Requirements	No Parallel Attachments MSA Scheduled Aperture PA 256.7620497 to 256.7620497 Degrees (V3 118.18748 to 118.18748)										

Proposal 1199 - Observation 5 - The metallicity of galaxies in the MACS J1149.5+2223 field

Mon Mar 20 16:00:42 GMT 2023

Observation	<p>Proposal 1199, Observation 5: NIRCam Imaging</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>																																																
Diagnostics	<p>(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 5:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 5:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 5:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 5:5) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 5:6) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																																																
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Special Requirements	<p>Group Visits within 53.0 Days</p> <p>Visits Same PA</p> <p>Offset 55.0 arcsec, -48.0 arcsec</p>																																																