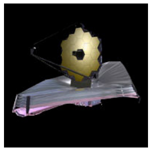

8582 - Towards a complete NIR/MIR view of the circumgalactic medium of a brightest cluster galaxy at z=0.4

Cycle: 4, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MRS				
	1	MRS_BCG_tail_SHORT_LONG	MIRI Medium Resolution Spectroscopy	(1) MACS1931.8-2635-BCG-TAIL
	2	MRS_Sky_SHORT_LONG	MIRI Medium Resolution Spectroscopy	(2) DEDICATED-SKY

Folder	***Observation***	***Label***	***Observing Template***	***Science Target***
NIRSpec				
	5	NIRSpec_BCG_tail	NIRSpec IFU Spectroscopy	(1) MACS1931.8-2635-BCG-TAIL
	6	NIRSpec_Sky	NIRSpec IFU Spectroscopy	(2) DEDICATED-SKY

ABSTRACT

Brightest cluster galaxies (BCGs) of cool-core clusters are uniquely suited for AGN feedback studies. Cycle 2 JWST observations toward one such cool-core BCG have revealed intriguing results: the circumgalactic medium (CGM) has warmer H2 than in the BCG, suggestive of jet-induced shock heating. Polycyclic aromatic hydrocarbon (PAH) 11.3um emission appears in clumps embedded in the CGM, hinting at an origin in clumpy, dense clouds to survive the destructive environment.

We request NIRSpec+MIRI/MRS IFU observations to complement the Cycle 2 data of this source. While the detections obtained with only 1 of the 3 MRS gratings are promising, full MRS spectral coverage is needed to properly model the continuum and cover the missing spectra features (H2 S(3), S(7), PAH 6.3, 7.7, 12.6um) to model the gas temperature, excitation and ionization conditions. NIRSpec will detect the PAH 3.3um band and ro-vibrational H2 lines. The full dataset will allow us to, for the first time, obtain a spatially resolved, contiguous NIRSpec+MRS spectrum over 2-28 micron of a BCG and its surrounding cold CGM, covering ~6000 sq kpc. The proposed JWST data will add to a rich ancillary dataset (ALMA, VLT/MUSE, VLA, MeerKAT, Chandra), enabling us to map out the baryon cycle (multiphase gas inflows and outflows), and address fundamental questions on the triggering and quenching of star formation in such environments. We will assess the role of shocks and turbulence in heating the CGM, and understand how molecular gas and PAH survive in harsh conditions in a cluster core. The program will set a new benchmark for the use of PAH as star formation rate indicators, and H2 lines as molecular gas tracers.

OBSERVING DESCRIPTION

The requested observations are designed to complement the archival Cycle 2 program (3629) obtained with the MRS MEDIUM sub-band

NIRSpec
- G395H/F290LP
- 3x3 mosaic

MIRI/MRS observations towards a spatially extended target
- request is for SHORT and LONG sub-bands, at matching depth to archival observations for MEDIUM sub-band

- 3x2 mosaic
- dedicated sky observation
- simultaneous MIRI imaging (with filters F560W and F100W)
- Note that the simultaenous MIRI imaging over the dedicated sky background will cover the science targets. This is accomplished by restricting the PA range.

Refer to Technical Justification and ETC notebooks for more details

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	MACS1931.8-2635-BCG-TAIL	RA: 19 31 49.5580 (292.9564917d) Dec: -26 34 29.29 (-26.57480d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: *Category=Galaxy* *Description=[Active galactic nuclei, Active galaxies, Brightest cluster galaxies, Radio jets, Starburst galaxies]* *Extended=YES*				
(2)	DEDICATED-SKY	RA: 19 31 50.6600 (292.9610833d) Dec: -26 33 18.90 (-26.55525d) Equinox: J2000		
Comments: *Category=Calibration* *Description=[Telescope/sky background]* *Extended=YES*				

Observation

Proposal 8582, Observation 1: MRS_BCG_tail_SHORT_LONG

Thu Aug 21 17:00:17 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[MRS_Sky_SHORT_LONG (Obs 2)]

Diagnostics

(Visit 1:1) Warning (Form): Data Excess over middle threshold

(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)	MACS1931.8-2635-BCG-TAIL	RA: 19 31 49.5580 (292.9564917d) Dec: -26 34 29.29 (-26.57480d) Equinox: J2000	Epoch of Position: 2015.5	

Comments:
Category=Galaxy
Description=[Active galactic nuclei, Active galaxies, Brightest cluster galaxies, Radio jets, Starburst galaxies]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
F560W	All MRS	YES	FULL	Allow Auto Reorder

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
2	3	10.0	10.0	20.0	20.0	DEFAULT

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F560W	FASTR1	16	6	1	Dither 1	4	24	1121.116	
1	SHORT(A)	MRSLONG		FASTR1	104	1	1	Dither 1	4	4	1154.417	218862
1	SHORT(A)	MRSSHORT		FASTR1	104	1	1	Dither 1	4	4	1154.417	218862
2		IMAGER	F1000W	FASTR1	10	12	1	Dither 1	4	48	1454.121	
2	LONG(C)	MRSLONG		FASTR1	135	1	1	Dither 1	4	4	1498.522	263381
2	LONG(C)	MRSSHORT		FASTR1	135	1	1	Dither 1	4	4	1498.522	263381

Special Requirements	Sequence Observations 1, 2, Non-interruptible

Observation

Proposal 8582, Observation 2: MRS_Sky_SHORT_LONG Thu Aug 21 17:00:17 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [MRS_BCG_tail_SHORT_LONG (Obs 1)]

Comments: Aperture position angle restricted to ensure that the MIRI imaging covers the science target (BCG+tail); this reduced schedulability

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)	DEDICATED-SKY	RA: 19 31 50.6600 (292.9610833d) Dec: -26 33 18.90 (-26.55525d) Equinox: J2000		

Comments:
Category=Calibration
Description=[Telescope/sky background]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	YES	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F560W	FASTR1	16	6	1	None	1	6	280.279	218862
1	SHORT(A)	MRSLONG		FASTR1	104	1	1	None	1	1	288.604	
1	SHORT(A)	MRSSHORT		FASTR1	104	1	1	None	1	1	288.604	
2		IMAGER	F1000W	FASTR1	10	12	1	None	1	12	363.53	263381
2	LONG(C)	MRSLONG		FASTR1	135	1	1	None	1	1	374.63	
2	LONG(C)	MRSSHORT		FASTR1	135	1	1	None	1	1	374.63	

Special Requirements	
	Aperture PA Range 27 to 97 Degrees (V3 27.0 to 97.0) Sequence Observations 1, 2, Non-interruptible

Observation

Proposal 8582, Observation 5: NIRSpec_BCG_tail

Thu Aug 21 17:00:17 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Background Observations:[NIRSpec_Sky (Obs 6)]

Diagnostics

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	MACS1931.8-2635-BCG-TAIL	RA: 19 31 49.5580 (292.9564917d) Dec: -26 34 29.29 (-26.57480d) Equinox: J2000	Epoch of Position: 2015.5	

Comments:
Category=Galaxy
Description=[Active galactic nuclei, Active galaxies, Brightest cluster galaxies, Radio jets, Starburst galaxies]
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
3	3	10.0	10.0	20.0	20.0	DEFAULT

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	4-POINT-DITHER				

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	NRSIRS2RAPID	15	1	false	true	NONE	4	4	933.689	225404

Special Requirements	Sequence Observations 5, 6, Non-interruptible

Observation

Proposal 8582, Observation 6: NIRSpec_Sky

Thu Aug 21 17:00:17 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Background Observation For: [NIRSpec_BCG_tail (Obs 5)]

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	DEDICATED-SKY	RA: 19 31 50.6600 (292.9610833d) Dec: -26 33 18.90 (-26.55525d) Equinox: J2000		

Comments:
Category=Calibration
Description=[Telescope/sky background]
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	NONE				

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	NRSIRS2RAPID	15	1	false	false	NONE	1	1	233.422	

Special Requirements

Sequence Observations 5, 6, Non-interruptible