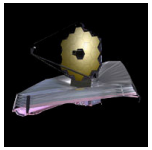

3722 - A new window onto star formation regulation in the most intense, dusty starbursts in the early Universe

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	3	J1127+4228: Pa-alpha, H2 1-0 S(3), Br-delta, PAH33	MIRI Medium Resolution Spectroscopy	(3) J1127+4228
	7	J1127+4228-BACKGROUND	MIRI Medium Resolution Spectroscopy	(7) J1127+4228-BACKGROUND
	4	J1053+0556 Pa-alpha, H2 S(3), FeII1.26, Br-delta, S(1), PAH33	MIRI Medium Resolution Spectroscopy	(4) J1053+0556
	8	J1053+0556-BACKGROUND	MIRI Medium Resolution Spectroscopy	(8) J1053+0556-BACKGROUND
	9	J1127+4228 [FeII]1.26 NIRSPEC	NIRSpec IFU Spectroscopy	(3) J1127+4228
	10	J1127+4228 [FeII]1.26 NIRSPEC-BACKGROUND	NIRSpec IFU Spectroscopy	(7) J1127+4228-BACKGROUND
	17	J1609+2920-BACKGROUND	MIRI Medium Resolution Spectroscopy	(6) J1609+6045-BACKGROUND

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	18	J1609+6045, P-alpha, H2 1-0 S(3), Br-delta, [FeII]1.26, PAH33	MIRI Medium Resolution Spectroscopy	(2) J1609+6045

ABSTRACT

Dusty starbursts in massive galaxies at redshifts z=2-4 (DSFGs) are the most vigorous sites of star formation known. What processes regulate and limit star formation at the highest rates? Rest-frame optical IFU spectroscopy has been very successful in probing outflows and star formation in main sequence galaxies, but failed to penetrate deep into the most extreme DSFGs at these redshifts. Through MIRI-MRS the bright NIR recombination and H2 lines are now observable at z=2-3, which are our best tracers of star formation and feedback in the nearby Universe, and also a new star-formation tracer, PAH3.3. With MIRI-IFU we will study 12 NIR lines in 3 of the brightest, gravitationally lensed galaxies on the sub-mm sky on scales of 200-300 pc. All have detailed lens models and wide sets of ancillary data including HST imaging and millimeter line and dust interferometry. We will obtain Pa-a, H2 1-0 S(3), [FeII]1.26, and Br-d, which will enable us to map the star formation rates, probe the presence of shocks from supernovae and gas accretion, and to compare their relative impact on the gas. The glow of warm H2 on the turbulent surfaces of molecular clouds has been observed in nearby starburst galaxies, but never in the early Universe, where it would demonstrate that turbulence, perhaps created by feedback or gas accretion, is indeed as widespread in these galaxies as often postulated. We will also search for blue wings of Pa-a and warm H2 that would probe outflowing gas, and be the first evidence of starburst-driven winds in these systems, and compare star-formation rate estimates from Pa-a and PAH3.3 to see whether the latter is a reliable star formation tracer.

OBSERVING DESCRIPTION

We will observe Pa-alpha, [FeII]1.26um, H2 1-0 S(3), Br-delta, and the 3.3-micron PAH feature in three bright, infrared selected, gravitationally lensed galaxies at redshifts z=2-3. NIR lines, that can now be observed with MIRI for the first time in these galaxies, are much more effective to probe the warm ionized and molecular gas in these galaxies than the optical, where extinctions are high, AV~4 and more. These five lines can be observed with two setups with MIRI, with the exception of J1127+4228, where [FeII] will be covered with a separate observation with NIRSPEC. We will observe at 200-300 mas resolution, the diffraction limit of the JWST in this wavelength regime, corresponding to scales of 200-300 pc.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	J1609+6045	RA: 16 09 17.7600 (242.3240000d) Dec: +60 45 21.00 (60.75583d) Equinox: J2000	Proper Motion RA: 0.0 mas/yr Proper Motion Dec: 0.0 mas/yr Parallax: 0.0" Epoch of Position: 2000	
Comments: *Category=Galaxy* *Description=[High-redshift galaxies]* *Extended=YES*				
(3)	J1127+4228	RA: 11 27 14.6770 (171.8111542d) Dec: +42 28 23.44 (42.47318d) Equinox: J2000	Proper Motion RA: 0.0 mas/yr Proper Motion Dec: 0.0 mas/yr Parallax: 0.0" Epoch of Position: 2000	
Comments: Our targets have all HST imaging available to derive accurate positions. *Category=Galaxy* *Description=[High-redshift galaxies]* *Extended=YES*				
(4)	J1053+0556	RA: 10 53 53.1430 (163.4714292d) Dec: +05 56 19.00 (5.93861d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Parallax: 0.0" Epoch of Position: 2000	
Comments: *Category=Galaxy* *Description=[High-redshift galaxies]* *Extended=YES*				
(6)	J1609+6045-BACKGROUND	RA: 16 09 17.1200 (242.3213333d) Dec: +60 45 27.00 (60.75750d) Equinox: J2000	Proper Motion RA: 0.0 mas/yr Proper Motion Dec: 0.0 mas/yr Parallax: 0.0" Epoch of Position: 2000	
Comments: *Category=Calibration* *Description=[Telescope/sky background]* *Extended=YES*				
(7)	J1127+4228-BACKGROUND	RA: 11 27 14.8800 (171.8120000d) Dec: +42 28 27.60 (42.47433d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Parallax: 0.0" Epoch of Position: 2000	
Comments: Our targets have all HST imaging available to derive accurate positions. *Category=Calibration* *Description=[Telescope/sky background]* *Extended=YES*				
(8)	J1053+0556-BACKGROUND	RA: 10 53 53.2300 (163.4717917d) Dec: +05 56 28.90 (5.94136d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Parallax: 0.0" Epoch of Position: 2000	
Comments: *Category=Calibration* *Description=[Telescope/sky background]* *Extended=YES*				

Observation

Proposal 3722, Observation 3: J1127+4228: Pa-alpha, H2 1-0 S(3), Br-delta, PAH33 Mon Feb 05 18:00:54 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(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)	J1127+4228	RA: 11 27 14.6770 (171.8111542d)	Proper Motion RA: 0.0 mas/yr	
		Dec: +42 28 23.44 (42.47318d)	Proper Motion Dec: 0.0 mas/yr	
		Equinox: J2000	Parallax: 0.0"	
			Epoch of Position: 2000	

Comments: Our targets have all HST imaging available to derive accurate positions.
Category=Galaxy
Description=[High-redshift galaxies]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	Channel 1	NO	FULL	NEUTRAL

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	MEDIUM(B)	MRSLONG		SLOWR1	20	1	1	Dither 1	4	4	1911.194	144272
1	MEDIUM(B)	MRSSHORT		SLOWR1	20	1	1	Dither 1	4	4	1911.194	144272
2	LONG(C)	MRSLONG		SLOWR1	40	2	1	Dither 1	4	8	7740.334	144272
2	LONG(C)	MRSSHORT		SLOWR1	40	2	1	Dither 1	4	8	7740.334	144272

Special Requirements	Sequence Observations 3, 7, Non-interruptible

Observation

Proposal 3722, Observation 7: J1127+4228-BACKGROUND Mon Feb 05 18:00:54 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(7)	J1127+4228-BACKGROUND	RA: 11 27 14.8800 (171.8120000d) Dec: +42 28 27.60 (42.47433d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Parallax: 0.0" Epoch of Position: 2000	

Comments: Our targets have all HST imaging available to derive accurate positions.
Category=Calibration
Description=[Telescope/sky background]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	Channel 1	NO	FULL	NEUTRAL

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	MEDIUM(B)	MRSLONG		SLOWR1	20	1	1	None	1	1	477.798	144272
1	MEDIUM(B)	MRSSHORT		SLOWR1	20	1	1	None	1	1	477.798	144272
2	LONG(C)	MRSLONG		SLOWR1	40	2	1	None	1	2	1935.084	144272
2	LONG(C)	MRSSHORT		SLOWR1	40	2	1	None	1	2	1935.084	144272

Special Requirements	Sequence Observations 3, 7, Non-interruptible

Observation

Proposal 3722, Observation 4: J1053+0556 Pa-alpha, H2 S(3), FeII1.26, Br-delta, S(1), PAH33 Mon Feb 05 18:00:54 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[J1053+0556-BACKGROUND (Obs 8)]

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)	J1053+0556	RA: 10 53 53.1430 (163.4714292d) Dec: +05 56 19.00 (5.93861d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Parallax: 0.0" Epoch of Position: 2000	

Comments:
Category=Galaxy
Description=[High-redshift galaxies]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	NO	FULL	NEUTRAL

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	SHORT(A)	MRSLONG		SLOWR1	20	2	1	Dither 1	4	8	3917.947	144266
1	SHORT(A)	MRSSHORT		SLOWR1	20	2	1	Dither 1	4	8	3917.947	144266
2	LONG(C)	MRSLONG		SLOWR1	35	2	1	Dither 1	4	8	6784.737	144266
2	LONG(C)	MRSSHORT		SLOWR1	35	2	1	Dither 1	4	8	6784.737	144266

Special Requirements	Sequence Observations 4, 8, Non-interruptible

Observation

Proposal 3722, Observation 8: J1053+0556-BACKGROUND Mon Feb 05 18:00:54 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [J1053+0556 Pa-alpha, H2 S(3), FeII1.26, Br-delta, S(1), PAH33 (Obs 4)]

Diagnostics

(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(8)	J1053+0556-BACKGROUND	RA: 10 53 53.2300 (163.4717917d) Dec: +05 56 28.90 (5.94136d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Parallax: 0.0" Epoch of Position: 2000	

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	NO	FULL	NEUTRAL

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	SHORT(A)	MRSLONG		SLOWR1	20	2	1	None	1	2	979.487	144266
1	SHORT(A)	MRSSHORT		SLOWR1	20	2	1	None	1	2	979.487	144266
2	LONG(C)	MRSLONG		FASTR1	35	2	1	None	1	2	197.028	144266
2	LONG(C)	MRSSHORT		FASTR1	35	2	1	None	1	2	197.028	144266

Special Requirements	Sequence Observations 4, 8, Non-interruptible

Observation

Proposal 3722, Observation 9: J1127+4228 [FeII]1.26 NIRSPEC Mon Feb 05 18:00:54 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 9:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	J1127+4228	RA: 11 27 14.6770 (171.8111542d) Dec: +42 28 23.44 (42.47318d) Equinox: J2000	Proper Motion RA: 0.0 mas/yr Proper Motion Dec: 0.0 mas/yr Parallax: 0.0" Epoch of Position: 2000	

Comments: Our targets have all HST imaging available to derive accurate positions.
Category=Galaxy
Description=[High-redshift galaxies]
Extended=YES

Template

TA Method
NONE

Dithers

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

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	4	1	false	true	NONE	4	4	1225.467	144272
2	G395H/F290LP	NRSIRS2	4	1	true	false	NONE	1	1	306.367	144272

Special Requirements

Aperture PA Range 138.97164917 to 303.97164917 Degrees (V3 0.0 to 165.0)

Sequence Observations 9, 10, Non-interruptible

Observation

Proposal 3722, Observation 10: J1127+4228 [FeII]1.26 NIRSPEC-BACKGROUND Mon Feb 05 18:00:54 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 10:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(7)	J1127+4228-BACKGROUND	RA: 11 27 14.8800 (171.8120000d) Dec: +42 28 27.60 (42.47433d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Parallax: 0.0" Epoch of Position: 2000	

Comments: Our targets have all HST imaging available to derive accurate positions.
Category=Calibration
Description=[Telescope/sky background]
Extended=YES

Template

TA Method
NONE

Dithers

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

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	4	1	false	true	NONE	4	4	1225.467	144272

Special Requirements

Aperture PA Range 138.97164917 to 303.97164917 Degrees (V3 0.0 to 165.0)

Sequence Observations 9, 10, Non-interruptible

Observation

Proposal 3722, Observation 17: J1609+2920-BACKGROUND Mon Feb 05 18:00:54 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [J1609+6045, P-alpha, H2 1-0 S(3), Br-delta, [FeII]1.26, PAH33 (Obs 18)]

Diagnostics

(Visit 17:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	J1609+6045-BACKGROUND	RA: 16 09 17.1200 (242.3213333d) Dec: +60 45 27.00 (60.75750d) Equinox: J2000	Proper Motion RA: 0.0 mas/yr Proper Motion Dec: 0.0 mas/yr Parallax: 0.0" Epoch of Position: 2000	

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	NO	FULL	NEUTRAL

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	LONG(C)	MRSLONG		FASTR1	40	2	1	None	1	2	224.778	144268
1	LONG(C)	MRSSHORT		FASTR1	40	2	1	None	1	2	224.778	144268
2	MEDIUM(B)	MRSLONG		SLOWR1	20	1	1	None	1	1	477.798	144268
2	MEDIUM(B)	MRSSHORT		SLOWR1	20	1	1	None	1	1	477.798	144268

Special Requirements	Sequence Observations 17, 18, Non-interruptible

Observation

Proposal 3722, Observation 18: J1609+6045, P-alpha, H2 1-0 S(3), Br-delta, [FeII]1.26, PAH33 Mon Feb 05 18:00:54 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[J1609+2920-BACKGROUND (Obs 17)]

Diagnostics

(Visit 18:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	J1609+6045	RA: 16 09 17.7600 (242.3240000d) Dec: +60 45 21.00 (60.75583d) Equinox: J2000	Proper Motion RA: 0.0 mas/yr Proper Motion Dec: 0.0 mas/yr Parallax: 0.0" Epoch of Position: 2000	

Comments:
Category=Galaxy
Description=[High-redshift galaxies]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	NO	FULL	NEUTRAL

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	LONG(C)	MRSLONG		SLOWR1	40	2	1	Dither 1	4	8	7740.334	144268
1	LONG(C)	MRSSHORT		SLOWR1	40	2	1	Dither 1	4	8	7740.334	144268
2	MEDIUM(B)	MRSLONG		SLOWR1	20	1	1	Dither 1	4	4	1911.194	144268
2	MEDIUM(B)	MRSSHORT		SLOWR1	20	1	1	Dither 1	4	4	1911.194	144268

Special Requirements	Sequence Observations 17, 18, Non-interruptible