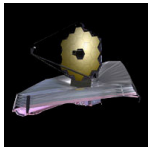

1264 - NIRSpec and MIRI IFS of SMGs

Cycle: 1, Proposal Category: GTO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MIRI - GN20				
	1	GN20-MRS [WRIGHT_0302]	MIRI Medium Resolution Spectroscopy	(1) GN20-MRS
	3	GN20.2B.2A-MRS [WRIGHT_0307+0308]	MIRI Medium Resolution Spectroscopy	(3) GN20.2B.2A-MRS
	5	GN20-Imager [WRIGHT_0301+0305]	MIRI Imaging	(2) GN20-IMAGER

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MIRI - HFLS3				
	6	HFLS3-MRS [WRIGHT_0401]	MIRI Medium Resolution Spectroscopy	(4) HFLS3-MRS
	8	HFLS3-Imager	MIRI Imaging	(5) HFLS3-IMAGER
NIRSpec - SMGs				
	9	GN20 - NIRSpec	NIRSpec IFU Spectroscopy	(6) GN20-NIRSPEC
	10	HFLS3 - NIRSpec	NIRSpec IFU Spectroscopy	(7) HFLS3-NIRSPEC

ABSTRACT

The observation IDs for the NIRSpec observations are:

GN20 FERRUIT_3049

HFLS3 FERRUIT_3050

And for MIRI:

GN20 MRS and IMAGER WRIGHT_0301 to 0308

HFLS3 MRS and IMAGER WRIGHT_0401 to 0403

This APT is for MIRI and NIRSpec-IFU observations of 2 high-z sub-millimeter galaxies.

The combination of spectral coverage and subarcsec integral field medium resolution spectroscopy (MRS), makes MIRI a unique instrument to peer into the dustenshrouded phase of IRluminous starforming galaxies (DSFG) at high redshifts. MIRI provides the first direct subarcsec view ever at the (restframe) nearinfrared light distribution of the evolved stellar population, ionized and hot molecular gas phase in z~26 massive DSFGs, and therefore will investigate the physical processes of the obscured star formation and black hole growth in massive starforming galaxies (SFR above 100 Msun/yr) in the early universe. MRS spectroscopy of the main near-infrared emission lines (hydrogen Paschen, [FeII], H2 , etc) will be obtained for the currently known highest redshift DSFG (HFLS3), and for a system of several DSFGs that could belong to a z~4 protocluster (GN20 and associated GN20.2a & GN20.2b). Mid-IR imaging of the host galaxies and surrounding fields will also be obtained with the MIRI imager.

The NIRSpec-IFU observations are part of the NIRSpec GTO Physics of Galaxy Assembly IFS survey. The goal of this program is to characterize the internal structure of distant galaxies and thereby investigate the primary physical processes driving galaxy evolution across cosmic time. The main specific objectives are to: trace the distribution of star formation, map the resolved properties of the stellar populations, trace the gas kinematics

(i.e. velocity fields, velocity dispersion) and hence determine dynamical masses and also identify non-virial motions (outflow and inflows), map metallicity gradients and dust extinction. These quantities will be mapped for the brightest and most extended star-forming galaxies and AGN/QSO hosts up to z>8.
The NIRSpec-IFU observations are performed at R100 and R2700. The specific band for the high-resolution observations is aimed at including the most important emission lines (from ~ H-beta to H-alpha).

OBSERVING DESCRIPTION
MIRI IFS and MIRI Imager:

The purpose of the program is to get a mid-IR spectra of the GN20 system (GN20 + GN20.2b + GN20.2a), and HFLS3, using 2 MRS configurations with simultaneous Imager observations (MEDIUM - F560W, LONG - F1000W). In addition, we request the imaging of the the GN20 system with F560W, F1000W, and F1000W for HFLS3. To save slew and maneuvering overheads, we propose all observations of each target to be "non-interruptible".

The PAs have been selected to avoid bright stars (which would saturate the detectors) in the MIRI fields, guarantee low background conditions, and existence of previos ancillary data.

The dithering strategies were selected to optimize the PSF and detector effects in all MRS channels and Imager filters. These strategies could be subject to change without modifying the total charged time.

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NIRSpec-IFU:

These two sub-millimeter galaxies will be observed using the NIRSpec-IFU as part of the “Physics of Galaxy Assembly IFU survey” program.

Observations will be performed with grating/filters PRISM (R100) and G395H/F290LP (R2700). By combining with the MIRI observations, we take advantage of the "smart accounting" option to save slew overheads.

For NIRSpec, the allowed PA range is defined such that contamination in the R100 spectra due to nearby sources leaking through the MSA is minimized. For the emission line high-resolution (R2700) spectra this is not so critical, but still we have checked for very bright sources in the MSA quadrants.

The PA restrictions of PA_V3 = 300-310 degrees for GN20 is free of bright sources which could contaminate the NIRSpec-IFU observations, and is limited by constrains for the MIRI observations.
The strict PA_V3 = 287 degrees for HFLS3 is free of bright sources which could contaminate the NIRSpec-IFU observations, and is limited by two very bright stars at both ends of the FoV for the MIRI observations.

We perform target acquisition with WATA, using the targets themselves, with settings to ensure a S/N above 20 (but far from saturation), as calculated using JWST ETC (v1.1.1).

A 4-point dither pattern will be used, were the first 4 points of the "medium" cycling pattern provide a good compromise between an amplitude (~0.5 ") large enough to "jump" the failed open microsutthers and to deal with other sources of background, while keeping a large FoV with complete exposure time (~2.5"x2.5"). This dither pattern also allows a good sub-pixel sampling.

No extra background exposures are included. For R100 it was considered that there will be a relatively large number of spaxels free from galaxy emission to derive the background. For the R2700, in addition, the goal is to study the emission lines and therefore the background should be less relevant.

Even though the contamination by bright targets leaking through the MSA is expected to be small for the PAs selected (see above), we take an extra leakage exposure for R100 in one pointing in order to be able to understand the effects of the surronding field.

The IRS2 reading mode was selected to maximise S/N.

The exposure times used were computed using JWST ETC (v1.1.1). A maximum duration of 3ksec was considered when arranging the number of

groups and integrations.

The total charged time of NIRSpec alone would be 10.56h. Subtracting half of the 0.98h we save on large slew time from combining with MIRI, the corrected charged time of the NIRSpec observations is 10.07h.

Observation

Proposal 1264, Observation 1: GN20-MRS [WRIGHT_0302] Wed Feb 21 00:04:57 GMT 2018

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution 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)	GN20-MRS	RA: 12 37 11.8885 (189.2995354d) Dec: +62 22 12.19 (62.37005d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=Galaxy
Description=[Active galactic nuclei]
Extended=Unknown

Acquisition

#	AcqTarget
1	NONE

Template

AcqFilter	*Primary Channel*	*Simultaneous Imaging*	*Imager Subarray*
F560W	ALL	YES	FULL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	ALL	Positive

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	FAST	126	6	1	Dither 1	4	24	8391.721	
1	MEDIUM(B)	MRSLONG		SLOW	44	2	1	Dither 1	4	8	8409.252	
1	MEDIUM(B)	MRSSHORT		SLOW	44	2	1	Dither 1	4	8	8409.252	
2		IMAGER	F1000W	FAST	126	6	1	Dither 1	4	24	8391.721	
2	LONG(C)	MRSLONG		SLOW	44	2	1	Dither 1	4	8	8409.252	
2	LONG(C)	MRSSHORT		SLOW	44	2	1	Dither 1	4	8	8409.252	

Special Requirements	
	Aperture PA Range 300 to 310 Degrees (V3 300.0 to 310.0) Group Observations 1, 3, 5, Non-interruptible

Observation

Proposal 1264, Observation 3: GN20.2B.2A-MRS [WRIGHT_0307+0308] Wed Feb 21 00:04:57 GMT 2018

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.

(Visit 3:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	GN20.2B.2A-MRS	RA: 12 37 9.2088 (189.2883700d) Dec: +62 22 1.96 (62.36721d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=Galaxy
Description=[Active galactic nuclei]
Extended=Unknown

Acquisition

#	AcqTarget
1	NONE

Template

AcqFilter	*Primary Channel*	*Simultaneous Imaging*	*Imager Subarray*
F560W	ALL	YES	FULL

Mosaic

Rows	*Columns*	*Row Overlap %*	*Column Overlap %*	*Row shift*	*Column shift*	*Tile Order*
1	2	0.0	-15.0	0.0	-45.0	DEFAULT

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	ALL	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	FAST	80	7	1	Dither 1	4	28	6216.09	
1	MEDIUM(B)	MRSLONG		SLOW	33	2	1	Dither 1	4	8	6306.939	
1	MEDIUM(B)	MRSSHORT		SLOW	33	2	1	Dither 1	4	8	6306.939	
2		IMAGER	F1000W	FAST	80	7	1	Dither 1	4	28	6216.09	
2	LONG(C)	MRSLONG		SLOW	33	2	1	Dither 1	4	8	6306.939	
2	LONG(C)	MRSSHORT		SLOW	33	2	1	Dither 1	4	8	6306.939	

Special Requirements	
	Sequence Visits , Non-interruptible Aperture PA Range 300.0 to 310.0 Degrees (V3 300.0 to 310.0) Visits Same PA Group Observations 1, 3, 5, Non-interruptible

Observation

Proposal 1264, Observation 5: GN20-Imager [WRIGHT_0301+0305] Wed Feb 21 00:04:57 GMT 2018

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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
(2)	GN20-IMAGER	RA: 12 37 16.4335 (189.3184729d) Dec: +62 21 48.66 (62.36352d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=Galaxy
Description=[Active galactic nuclei]
Extended=Unknown

Template

Subarray

FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets	1	5		2	1	POINT SOURCE	POSITIVE	DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F560W	FAST	80	1	1	Dither 1	4	4	888.013	
2	F1000W	FAST	90	1	1	Dither 1	4	4	999.014	

Special Requirements

Aperture PA Range 305.015224 to 315.015224 Degrees (V3 300.565519 to 310.565519)

Group Observations 1, 3, 5, Non-interruptible

Observation

Proposal 1264, Observation 6: HFLS3-MRS [WRIGHT_0401] Wed Feb 21 00:04:57 GMT 2018

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

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
(4)	HFLS3-MRS	RA: 17 06 47.8000 (256.6991667d) Dec: +58 46 23.51 (58.77320d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=Galaxy
Description=[Active galactic nuclei]
Extended=Unknown

Acquisition

#	AcqTarget
1	NONE

Template

AcqFilter	*Primary Channel*	*Simultaneous Imaging*	*Imager Subarray*
F560W	ALL	YES	FULL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	ALL	Positive

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	FAST	126	6	1	Dither 1	4	24	8391.721	
1	MEDIUM(B)	MRSLONG		SLOW	44	2	1	Dither 1	4	8	8409.252	
1	MEDIUM(B)	MRSSHORT		SLOW	44	2	1	Dither 1	4	8	8409.252	
2		IMAGER	F1000W	FAST	126	6	1	Dither 1	4	24	8391.721	
2	LONG(C)	MRSLONG		SLOW	44	2	1	Dither 1	4	8	8409.252	
2	LONG(C)	MRSSHORT		SLOW	44	2	1	Dither 1	4	8	8409.252	

Special Requirements	
	Aperture PA Range 287.0 to 287.0 Degrees (V3 287.0 to 287.0) Group Observations 6, 8, Non-interruptible

Observation

Proposal 1264, Observation 8: HFLS3-Imager

Wed Feb 21 00:04:57 GMT 2018

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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
(5)	HFLS3-IMAGER	RA: 17 06 48.5975 (256.7024896d) Dec: +58 46 8.98 (58.76916d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=Galaxy
Description=[Active galactic nuclei]
Extended=Unknown

Template

Subarray

FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets	1	5		7	1	POINT SOURCE	POSITIVE	SMALL

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1000W	FAST	90	1	1	Dither 1	4	4	999.014	

Special Requirements

Aperture PA Range 292.015224 to 292.015224 Degrees (V3 287.565519 to 287.565519)

Group Observations 6, 8, Non-interruptible

Observation

Proposal 1264, Observation 9: GN20 - NIRSpec Wed Feb 21 00:04:57 GMT 2018

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
(6)	GN20-NIRSPEC	RA: 12 37 11.8999 (189.2995829d) Dec: +62 22 12.10 (62.37003d) Equinox: J2000		

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

Template

TA Method

NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	MEDIUM	1	4	

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	125	1	false	true	NONE	4	4	7352.801	
2	PRISM/CLEAR	NRSIRS2RAPID	60	1	false	true	NONE	4	4	3559.689	
3	PRISM/CLEAR	NRSIRS2RAPID	60	1	true	false	NONE	1	1	889.922	

Special Requirements

Aperture PA Range 78.892975 to 88.892975 Degrees (V3 300.0 to 310.0)

Observation

Proposal 1264, Observation 10: HFLS3 - NIRSpec Wed Feb 21 00:04:57 GMT 2018

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)	HFLS3-NIRSPEC	RA: 17 06 47.8000 (256.6991667d) Dec: +58 46 23.51 (58.77320d) Equinox: J2000		

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

Template

TA Method

NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	MEDIUM	1	4	

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	125	1	false	true	NONE	4	4	7352.801	
2	PRISM/CLEAR	NRSIRS2RAPID	60	1	false	true	NONE	4	4	3559.689	
3	PRISM/CLEAR	NRSIRS2RAPID	60	1	true	false	NONE	1	1	889.922	

Special Requirements

Aperture PA Range 65.892975 to 65.892975 Degrees (V3 287.0 to 287.0)