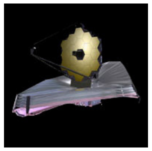

1033 - MIRI LRS Photometric Sensitivity and Stability

Cycle: 0, Proposal Category: COM/MIRI

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Repeat 1				
	1	Target FAINT slit	MIRI Low Resolution Spectroscopy	(2) TYC-4212-455-1-FAINT
	2	Target BRIGHT slit	MIRI Low Resolution Spectroscopy	(1) BD+60-1753-BRIGHT
	3	Target BRIGHT slitless	MIRI Low Resolution Spectroscopy	(1) BD+60-1753-BRIGHT
	4	Commissioning - FULL frame	MIRI External Flat	NONE
L 168-9b				
	5	L168-9b LRS	MIRI Low Resolution Spectroscopy	(4) L168-9
	6	Commissioning - FULL frame	MIRI External Flat	(5) L168-9-OFFTARGET

ABSTRACT

This commissioning activity will verify the spectral response function for the low resolution spectrometer in MIRI. The data obtained in the CAR will be used to update the relevant calibration data product, important for flux calibration of LRS science observations. We use 2 targets of different

spectral types, observing each with both the slit and slitless modes of the LRS. In addition, we will measure the stability of the flux calibration over transit-like timescales with the slitless mode by obtaining one longer exposure.

The CAR will be repeated twice in the commissioning timeline to check stability over a timescale of days; only one of the targets will be observed in this second occurrence of the CAR.

OBSERVING DESCRIPTION

In this activity we will observe 2 photometric standard stars using the LRS in both slit and slitless mode. Targets were selected to enable us to measure the LRS sensitivity in a “representative” flux regime: for slit mode we selected a fainter target to allow us to take long ramps; for slitless a brighter target is more typical.

Our primary “bright” target BD+60 1753 only has visibility to early October 2019; if the launch falls later than 24 April 2019, this target would need replacing. We have included HD 180609, an A dwarf with similar magnitude as BD+60, as backup. The faint target 2MASS J17571324 has good visibility throughout our window.

To ensure a high-quality measurement over the full LRS wavelength range, exposure times were calculated to ensure a SNR of 50 at 12 μm for both slit and slitless modes.

We aim to test the spectrophotometric stability in slitless mode over a long observation (~1.5 hours) for the bright target, as may be carried out for a time series observation of a bright exoplanet host star. This observation is carried out in a single exposure. We integrate up the ramp to the maximum extent before saturation occurs (ngroups = 140, 22.24 seconds), and add integrations until we reach ~1.5 hours of total integration time (240 integrations). This will help us establish the noise floor of such observations in a regime that has not been tested on the ground.
Target 2, which is much fainter, will be observed with LRS slit only. We aim again for a SNR of 50 at 12 μm.

For the slit observations we use the standard along-slit dither strategy; for slitless no dithering is performed. No dedicated background observations are required for point source observations with LRS. Target acquisition will be performed for all cases, using the science targets themselves, with the F1500W filter.

Changes 2 Nov 2017 (after 1st PIT review):

- removed the 2nd iteration of the activity
- added the Time Series Observation & No Parallel special requirements to the LRS slitless observation (Obs 2).

This submission corresponds to v1.3 of the CAR description file.

Changes 3 September 2019 (for internal CAR review):

- updated the ngroups for target acquisition to account for APT changes.

Changes 31 March 2021:

- added TA verification image for the slit observations

Changes 1 Nov 2021:

- Removed the TSO observation and reverted the slitless observation of BD+60 to execute 240 integrations for "TSO-like" conditions
- Reordered the observations to do faint slit -> bright slit -> bright slitless
- Added the external flat observation to revert to full frame mode at the end of the CAR

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	BD+60-1753-BRIGHT	RA: 17 24 52.2759 (261.2178162d) Dec: +60 25 50.75 (60.43076d) Equinox: J2000	Proper Motion RA: 4.656 mas/yr Proper Motion Dec: 3.762 mas/yr Parallax: 0.00165" Epoch of Position: 2000.0	
Comments: GAIA coordinates Category=Star Description=[A stars] Extended=NO				
(2)	TYC-4212-455-1-FAINT	RA: 17 57 13.2329 (269.3051371d) Dec: +67 03 40.76 (67.06132d) Equinox: J2000		
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[A dwarfs] Extended=NO				
(3)	HD180609-BRIGHT-BACKUP	RA: 19 12 47.1997 (288.1966654d) Dec: +64 10 37.18 (64.17699d) Equinox: J2000	Proper Motion RA: -3.53 mas/yr Proper Motion Dec: -7.82 mas/yr Parallax: 0.00196" Epoch of Position: 2000.0	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[A dwarfs] Extended=NO				
(4)	L168-9	RA: 23 20 6.8620 (350.0285917d) Dec: -60 03 56.63 (-60.06573d) Equinox: J2000	Proper Motion RA: -0.04274148849471337 sec of time/yr Proper Motion Dec: -0.12778200007232954 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Exoplanet Systems, M dwarfs]				
(5)	L168-9-OFFTARGET	RA: 23 20 4.0000 (350.0166667d) Dec: -60 03 32.00 (-60.05889d) Equinox: J2000	Proper Motion RA: 0.001 sec of time/yr Proper Motion Dec: 0.001 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. This offset target was defined for the extended flat observation at the end of the subarray exposure - to avoid heavy saturation Category=Star Description=[Exoplanet Systems, M dwarfs]				

Observation

Proposal 1033, Observation 1: Target FAINT slit Tue May 24 01:00:13 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Target FAINT slit (Obs 1)) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(Exposure) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	TYC-4212-455-1-FAINT	RA: 17 57 13.2329 (269.3051371d) Dec: +67 03 40.76 (67.06132d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[A dwarfs]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 TYC-4212-455-1-FAINT	F1000W	FAST	4	1	1	11.1	

Template

Subarray	Obtain Verification Image?
FULL	true

Dithers

#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset
1	ALONG SLIT NOD				

Pointing Verification

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	FAST	4	1	1	11.1	

Proposal 1033 - Observation 1 - MIRI LRS Photometric Sensitivity and Stability

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	40	3	6	1	2	677.11	

Special Requirements

Sequence Observations 1, 2, 3, 4, Non-interruptible

Observation

Proposal 1033, Observation 2: Target BRIGHT slit

Tue May 24 01:00:13 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Target BRIGHT slit (Obs 2)) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(Exposure) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	BD+60-1753-BRIGHT	RA: 17 24 52.2759 (261.2178162d) Dec: +60 25 50.75 (60.43076d) Equinox: J2000	Proper Motion RA: 4.656 mas/yr Proper Motion Dec: 3.762 mas/yr Parallax: 0.00165" Epoch of Position: 2000.0	

Comments: GAIA coordinates
Category=Star
Description=[A stars]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 BD+60-1753-BRIGHT	F1500W	FAST	4	1	1	11.1	

Template

Subarray	Obtain Verification Image?
FULL	true

Dithers

#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset
1	ALONG SLIT NOD				

Pointing Verification

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	FAST	4	1	1	11.1	

Proposal 1033 - Observation 2 - MIRI LRS Photometric Sensitivity and Stability

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	10	6	12	1	2	360.755	

Special Requirements

Sequence Observations 1, 2, 3, 4, Non-interruptible

Observation

Proposal 1033, Observation 3: Target BRIGHT slitless

Tue May 24 01:00:13 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Target BRIGHT slitless (Obs 3)) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(Exposure) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	BD+60-1753-BRIGHT	RA: 17 24 52.2759 (261.2178162d) Dec: +60 25 50.75 (60.43076d) Equinox: J2000	Proper Motion RA: 4.656 mas/yr Proper Motion Dec: 3.762 mas/yr Parallax: 0.00165" Epoch of Position: 2000.0	

Comments: GAIA coordinates
Category=Star
Description=[A stars]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 BD+60-1753-BRIGHT	F1500W	FAST	6	1	1	0.954	

Template

Subarray	Obtain Verification Image?
SLITLESSPRISM	true

Dithers

#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset
1	NONE				

Pointing Verification

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	FAST	6	1	1	0.954	

Proposal 1033 - Observation 3 - MIRI LRS Photometric Sensitivity and Stability

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	140	15	15	1	1	336.211	

Special Requirements

Time Series Observation
No Parallel

Sequence Observations 1, 2, 3, 4, Non-interruptible

Observation

Proposal 1033, Observation 4: Commissioning - FULL frame

Tue May 24 01:00:13 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI External Flat

Comments: Visit to leave the imager in FULL frame mode at the end of this CAR. Necessary to minimize the impacts of subarray imprints on subsequent MIRI imager CARs.

Diagnostics

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

Template

Pointing Type	Detector	Dither	Lamp Use	Lamp On Time	Imager Subarray
PRIME	IMAGER	false	OFF ONLY	0	FULL

Spectral Elements

#	Detector	Filter	Wavelength 1 & 4	Wavelength 2 & 3	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	IMAGER	P750L			FASTR1	4	1	1	1	1	11.1	

Special Requirements

No Parallel

Sequence Observations 1, 2, 3, 4, Non-interruptible

Observation

Proposal 1033, Observation 5: L168-9b LRS

Tue May 24 01:00:13 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(L168-9b LRS (Obs 5)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	L168-9	RA: 23 20 6.8620 (350.0285917d) Dec: -60 03 56.63 (-60.06573d) Equinox: J2000	Proper Motion RA: -0.04274148849471337 sec of time/yr Proper Motion Dec: -0.12778200007232954 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Exoplanet Systems, M dwarfs]

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	F1000W	FAST	4	1	1	0.636	104303.12

Template

Subarray	Obtain Verification Image?
SLITLESSPRISM	true

Dithers

#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset
1	NONE				

Pointing Verification

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	FAST	4	1	1	0.636	104303.12

Proposal 1033 - Observation 5 - MIRI LRS Photometric Sensitivity and Stability

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	9	9371	9371	1	1	14903.479	104303.11

Special Requirements

Phase 0.91616 to 0.94589 with period 1.401526 Days and zero-phase 2458637.16604 HJD
Time Series Observation
No Parallel

Observation

Proposal 1033, Observation 6: Commissioning - FULL frame

Tue May 24 01:00:13 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI External Flat

Comments: Visit to leave the imager in FULL frame mode at the end of this CAR. Necessary to minimize the impacts of subarray imprints on subsequent MIRI imager CARs.

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
(5)	L168-9-OFFTARGET	RA: 23 20 4.0000 (350.0166667d)	Proper Motion RA: 0.001 sec of time/yr	
		Dec: -60 03 32.00 (-60.05889d)	Proper Motion Dec: 0.001 arcsec/yr	
		Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

This offset target was defined for the extended flat observation at the end of the subarray exposure - to avoid heavy saturation
Category=Star
Description=[Exoplanet Systems, M dwarfs]

Template

Pointing Type	Detector	Dither	Lamp Use	Lamp On Time	Imager Subarray
PRIME	IMAGER	false	OFF ONLY	0	FULL

Spectral Elements

#	Detector	Filter	Wavelength 1 & 4	Wavelength 2 & 3	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	IMAGER	P750L			FASTR1	4	1	1	1	1	11.1	

Special Requirements

No Parallel