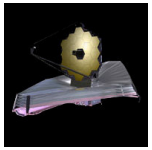

1413 - MIRI coronagraphy of the Cold Substellar Companion GJ 758 B

Cycle: 1, Proposal Category: GTO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	GJ 758 F1065 roll 1	MIRI Coronagraphic Imaging	(1) GJ-758
	51	GJ 758 F1065 roll 1	MIRI Coronagraphic Imaging	(6) GJ-758-revised
	2	GJ 758 F1140 roll 1	MIRI Coronagraphic Imaging	(1) GJ-758
	52	GJ 758 F1140 roll 1	MIRI Coronagraphic Imaging	(6) GJ-758-revised
	3	GJ 758 F1550 roll 1	MIRI Coronagraphic Imaging	(1) GJ-758
	53	GJ 758 F1550 roll 1	MIRI Coronagraphic Imaging	(6) GJ-758-revised
	4	GJ 758 F1550 roll 1 BACKGROUND	MIRI Coronagraphic Imaging	(3) GJ-758-Background
	5	GJ 758 F1140 roll 1 BACKGROUND	MIRI Coronagraphic Imaging	(3) GJ-758-Background
	6	GJ 758 F1065 roll 1 BACKGROUND	MIRI Coronagraphic Imaging	(3) GJ-758-Background

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	7	HD 190360 F1065 (PSF star)	MIRI Coronagraphic Imaging	(2) HD-190360
	8	HD 190360 F1140 (PSF star)	MIRI Coronagraphic Imaging	(2) HD-190360
	9	HD 190360 F1550 (PSF star)	MIRI Coronagraphic Imaging	(2) HD-190360
	10	HD 190360 F1550 (PSF star) BACKGROUND	MIRI Coronagraphic Imaging	(4) HD-190360-BACKGROUND
	11	HD 190360 F1140 (PSF star) BACKGROUND	MIRI Coronagraphic Imaging	(4) HD-190360-BACKGROUND
	12	HD 190360 F1065 (PSF star) BACKGROUND	MIRI Coronagraphic Imaging	(4) HD-190360-BACKGROUND
	13	GJ 758 F1065 roll 2	MIRI Coronagraphic Imaging	(1) GJ-758
	54	GJ 758 F1065 roll 2	MIRI Coronagraphic Imaging	(6) GJ-758-revised
	14	GJ 758 F1140 roll 2	MIRI Coronagraphic Imaging	(1) GJ-758
	55	GJ 758 F1140 roll 2	MIRI Coronagraphic Imaging	(6) GJ-758-revised
	15	GJ 758 F1550 roll 2	MIRI Coronagraphic Imaging	(1) GJ-758
	56	GJ 758 F1550 roll 2	MIRI Coronagraphic Imaging	(6) GJ-758-revised

ABSTRACT

The brown dwarf orbiting GJ 758 is one of the coldest sub-stellar mass companions imaged to date. Ground based near-IR photometry and spectroscopy have confirmed an effective temperature of ~700K, and identified a methane-rich atmosphere. Multi-epoch coronagraphic imaging indicates an almost edge-on and eccentric orbit, with the companion moving towards the star at a projected ~100 mas/year. While cooling-track-derived masses place this object above the purported deuterium-burning limit, it is an important benchmark since its orbit is favorable for the future determination of its dynamical mass using astrometry or radial velocity. A thorough characterization of its atmospheric properties will provide a key reference point to compare to field substellar objects of similar temperatures. Moreover understanding its composition will answer fundamental question regarding the formation of such rare objects (using “metallicity” as a proxy).

We will use the MIRI coronagraphs to obtain 10.65, 11, and 15 micron photometry of this sub-stellar companion. This will allow us to probe the ammonia abundance, and compare the properties of this cool bound substellar companion to the atmospheres observed for isolated field brown

dwarfs.

OBSERVING DESCRIPTION

SUMMARY AND OVERALL OBSERVING STRATEGY

We observe this brown dwarf companion using all 3 of MIRI's FQPM coronagraphs. Because the companion is moving closer to the star in projected separation, with an expected separation in 2019 of 1" (= ~2 lambda/D at 15 microns), we will use the Small Grid Dither technique and KLIP algorithm to build an optimal PSF reference for subtraction from each integration in our observations. We follow the recommended coronagraphic practices of observing the science target in 2 rolls and observing a nearby PSF reference star in an un-interrruptible sequence.

In addition to the intrinsic scientific value of characterizing GJ 758 B (See e.g. Bowler et al. 2019 AJ 155), a strong secondary goal of this program is assessing coronagraphic performance and observing strategies, particularly for close-in companions. We therefore adopt "all the bells and whistles", including the maximal 9-position small grid dither and the use of multiple rolls on the science target. The maximum achievable instantaneous PA offset range for this target is ~12 degrees; with that available roll range, the companion's projected position will move by between 0.4 and 0.6 lambda/D for lambda=10.65 to 15.5 microns. This will necessarily result in some self-subtraction when using the other roll as part of the PSF library, which we intend to calibrate out using our forward modeling methods. We will thus be able to compare the relative performance of ADI, classical RDI, and 5- and 9-point small grid dither KLIP RDI strategies.

The PSF observations incidentally also will serve as background observations, though we expect to be contrast limited more than background limited.

Ordering Of Observations

All observations are grouped by a "Sequence Observations, Non-Interruptible" special requirement (aka "Seq Non-Int SR") to ensure the PSF calibrator is observed close in time to the science target.

Within that we order the observations to maximize efficiency by minimizing slews: We first obtain all 3 filters at PA roll 1, then all 3 filters in roll 2, then all 3 filters for the PSF star. We debated whether to place the block of 3 PSF star observations at the end, or in between the two science rolls.

For now we opted to place it in the middle (following e.g. typical HST best practices with STIS). The delta time between putting the PSF star in the middle or at the end is negligible; < 100 s. (A very different possibilty would be grouping together the 3 observations in each filter, which would add about 4800 s more total slew time. We would only consider that if commissioning results show the telescope to be substantially less stable with time than it was designed to be.)

Choice of PSF star

We searched SIMBAD for stars of equal or slightly greater brightness within 10 degrees of the science target. (We did not seek out PSF stars more than 1 mag brighter than the science target in order to minimize any potential systematics from drastically changing the ratio of stellar flux to thermal background flux, since the PSF subtraction process must account for both of those effects.) While matching spectral type is less critical for MIRI's relatively narrow FQPM filters we also prioritized getting a good spectral match, in part as a convenience since it allows for a nearly constant flux ratio between the target and calibrator to simplify exposure planning.

Given those criteria our chosen PSF calibrator is HD 190360 (=GJ 777 A), which is 0.4 mag brighter than the science target, a close match in spectral type and color, and is relatively nearby (9 deg separation). We note that HD 190360 is itself a known exoplanet host star, with a 1.6 MJup planet in a 4 AU orbit plus an inner Neptune-mass planet. Neither planet cannot be spatially resolved by JWST, with projected separations < 1 lambda/D at MIRI wavelengths. Furthermore, this star's estimated age is > 6-7 Gyr, putting even the Jovian planet below MIRI's detection floor. The fact that this is a well studied system is valuable, since the substantial available data on this star confirms it will appear optically single at JWST's resolution. It does have a suspected comoving companion red dwarf GJ 777B, but at a very wide separation that places it outside of the MIRI coronagraphic field of view entirely.

PA Special Requirements, and Implied Time Constraints

We used the Coronagraphic Target Visibility Tool to plan the PA special requirements. The companion's PA in roughly the middle of Cycle 1 (epoch 2022.5) will be ~ 223 deg. Separation approx 1.4 arcsec. See Bowler et al. 2018.

There are 3 good scheduling windows, which placing the companion in 3 different detector quadrants. The middle one (near day of year 200) is best

because we can get 12 deg roll there but at the extremes of the visibility period it's down to 9 deg roll. We have set up the program to use that scheduling opportunity. If for scheduling reasons it proves necessary to loosen constraints or to use one of the other opportunities (near day of year 110 or 290), we can work with our PC to adjust the Special Requirements accordingly.

In particular we:
- Set "Same PA as" SRs linking the 3 science observations at each roll angle. This is to ensure consistent positioning of the target in all 3 MIRI datasets. It also increases observational efficiency slightly by avoiding rolls between those visits.
- Set the "Aperture PA offset" SR between the two observations in each filter to the range 11 to 14 deg. The maximum available roll appears to be ~ 12.5 deg according to the CTVT. (Given the "Same PA as" SRs, it is a bit redundant to repeat this SR for all 3 filters. But leaving it off produces a warning in APT, so we went with the redundant approach.)
- Set an absolute "Aperture PA Range" SR to the range 173-183 deg for Observation 1, which positions the companion in quadrant 2 well away from the FQPM boundaries. Putting roll 1 near PA~170 also yields good target positioning in roll 2 as well after applying the offset SR. The ten degree range yields about a 10 day scheduling window.

The above PAs are only slightly changed from the prior version of this program: The companion moves in PA from about 215 deg to 223 deg during this latest 3 year delay in the timing of Cycle 1.

EXPOSURE TIMES, GROUPS, AND INTS

Exposure times were calculated in the JWST ETC using workbook #25164). In F1065 and F1150 an exposure time of ~ 600 s yields predicted SNR ~ 47 and 67 respectively in one roll, or ~ 66 and 93 combined across the two rolls. Our key goal is comparing the 10.65 and 11.5 micron measurements to measure the NH3 absorption, so to minimize systematics between those filters we use the same readout settings in both filters. We note that these are the optimistic photon-noise-limited SNRs, and in practice systematics from imperfect PSF subtraction and other calibrations (e.g. overall photometric calibration of MIRI) will also contribute limits, plausibly at a level of a few percent; by aiming for photon-limited SNR > 50 in the roll-combined data we seek to ensure the statistical photon noise is low enough to be below the likely systematic noise terms. In F1550 with the much higher thermal background an exposure time of ~850 s yields predicted SNR ~ 24 in one roll, or 34 in the two rolls combined, which is sufficient for our science goals in constraining the long wavelength continuum.

For F1065 and F1150 we adopt 575 s (Groups=600, Ints=4 with FAST readout of the coronagraphic subarrays). Those fill the detector to 0.83 and 0.61 of saturation, respectively. For F1550 we increase the Ints by 50% to partially make up for the higher thermal background. The specific exposure settings chosen were verified in the ETC to not produce any warnings. In 600 groups the peak pixel will remain < 20% of full well so there is no danger of saturation in F1550. As noted above each filter is repeated in two observations at different rolls.

The PSF star is 0.4 mag brighter than the science target (=45%; checked at both 2MASS and WISE bands), so we adjust the integration time to be 1/1.45 ~ 0.68x as long in each filter, to achieve similar peak count per integration in the PSF star as in the science target.

Since we are using the 9-point SGD option, we also reduce the number of ints per dither position by 2x to keep the total exposure time from becoming excessive ("excessive" taken to mean PSF exposure time >= 2x the total on-source science exposure time summed across the two rolls). Since the full set of PSF calibrator dither positions is combined to generate the KLIP eigenbasis, we do not need to achieve the same SNR per each individual dither position as on the science target. Specifically we expect the SNR of the PSF relative to the science target to be between 1/sqrt(2), for individual dither positions, and 3*sqrt(2), for the combined KLIP reference library mean PSF mode. If we oversimplfy and say that the subtracted PSF is a linear combination of 4 of the 9 dither positions, the SNR should be approximately comparable on the PSF star and science target. (This isn't a fully rigorous justification; experience will help show what works well in terms of balancing time when taking 9 point dithers.) We will of course assess how well this all works in practice and share best practices with the community.

TARGET ACQUISITION

The target star is bright so we have to use the ND filter for TA. ETC calculations indicate a high SNR acquisition can be obtained with groups=45, ints=1 which yields SNR~260. Given MIRI's pixel scale this high SNR should allow centroiding to 1 mas or better. The exposure time is only 10 s. We checked there is no danger of saturation, which would only happen for exposure times > 100 s. Since there is high SNR and plenty of leeway in the dynamic range we can use the same TA settings for the PSF star too without needing a separate ETC calculation.

The companion is at position angle ~215. As noted above there are 3 good scheduling windows placing the companion in 3 detector quadrants. The middle one (near day of year 200, placing the companion in quadrant 2) is best because we can get 12 deg roll there but at the extremes of the visibility period it’s down to 9 deg roll. With the companion in quadrant 2, we can leave the TA in the default quadrant 1.

QUESTIONS FOR CONTACT SCIENTIST:
==========

1. Our chosen detector settings with NGROUPS=600 seems consistent with the recommended "MIRI Imaging Recommended Strategies" and "MIRI Generic Recommended Strategies" pages on JDox, but it appears those recommendations are stated for full array readouts. Does the recommendation change for subarray readouts? Between say NGROUPS=600, NINTS=4 and NGROUPS=300, NINTS=8, is there any clear reason to prefer one or the other? We welcome advice in tweaking the NGROUPS and NINTS to maximize SNR while conserving total exposure time. (Perrin discussed this briefly with Bryony Nickson in 2019 June and she concurred in adjusting from our prior plan of 300*8 to 600*4. Playing with these trades in the ETC seems to show only negligible effects on the SNR, so I think we're good and have no major concerns. But let me know if you have any suggestions.)

2. Should we consider adding a separate thermal background observation for F1550? (e.g. offset away from the star then take an exposure on blank sky in the coronagraphic mode.) Could that be done with some MIRI engineering template? Thermal background is not likely to be a dominant contributor compared to the PSF itself but it will impact at some level, and since we're interested in aggressively exploring performance with this program we could try taking a calibration as a small experiment to see if it helps appreciably in the reductions. The cost in time would be tiny compared to the 9-point SGD PSF observations (just offset, configure MIRI's wheel to F1550C if not already there, and take an exposure in ACS=Coarse mode without even guiding probably, yes?). Let's discuss.

QUESTION FOR PROGRAM COORDINATOR:
==========

1. For the Aperture PA Offset SRs, is there a good way to specify "Please give us the maximum delta roll allowed at the time of scheduling"? Is what we have done now adequate? We'd take any extra fractional degrees that might be schedulable. Should we wait for LRP dates to be assigned then tweak the offset SR to the maximum allowed on that date?

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GJ-758	RA: 19 23 34.0132 (290.8917217d) Dec: +33 13 19.08 (33.22197d) Equinox: J2000	Proper Motion RA: 81.966 mas/yr Proper Motion Dec: 160.158 mas/yr Parallax: 0.06407" Epoch of Position: 2015.5	
Comments: Spectral type G9 *K=4.493* *Coordinates, PM, uncertainties and parallax updated to Gaia eDR3.* *This is a moderately high proper motion star.* *Category=Star* *Description=[Exoplanets, G stars, Substellar companions]* *Extended=NO*				
(2)	HD-190360	RA: 20 03 37.4053 (300.9058554d) Dec: +29 53 48.49 (29.89680d) Equinox: J2000	Proper Motion RA: 683.035 mas/yr Proper Motion Dec: -525.309 mas/yr Parallax: 0.06306" Epoch of Position: 2000.0	
Comments: Spectral type G7 *K=4.076* *Coordinates, PM, and uncertainties updated to Gaia DR1. Parallax is still from Hipparcos.* *Note, this is a high proper motion star!* *Category=Star* *Description=[Exoplanets, G stars]* *Extended=NO*				
(3)	GJ-758-Background	RA: 19 23 42.5000 (290.9270833d) Dec: +33 13 15.00 (33.22083d) Equinox: J2000		
Comments: *Category=Calibration* *Description=[Telescope/sky background]*				
(4)	HD-190360-BACKGROUND	RA: 20 03 42.0000 (300.9250000d) Dec: +29 55 53.50 (29.93153d) Equinox: J2000		
Comments: *Category=Calibration* *Description=[Telescope/sky background]*				
(6)	GJ-758-revised	RA: 19 23 34.0132 (290.8917217d) Dec: +33 13 19.08 (33.22197d) Equinox: J2000	Proper Motion RA: 81.966 mas/yr Proper Motion Dec: 160.158 mas/yr Parallax: 0.0640703" Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *2023-Aug-04: Epoch and equinox of RA/Dec values have both been updated to J2000.0 from Gaia EDR3, which is also the origin of the RA/Dec uncertainties, parallax, and proper motion values.* *Category=Star* *Description=[Exoplanets, G dwarfs, Substellar companions]*				

Observation

Proposal 1413, Observation 1: GJ 758 F1065 roll 1 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observations:[GJ 758 F1140 roll 1 (Obs 2), GJ 758 F1550 roll 1 (Obs 3), GJ 758 F1550 roll 1 BACKGROUND (Obs 4), GJ 758 F1140 roll 1 BACKGROUND (Obs 5), GJ 758 F1065 roll 1 BACKGROUND (Obs 6), GJ 758 F1065 roll 2 (Obs 13), GJ 758 F1140 roll 2 (Obs 14), GJ 758 F1550 roll 2 (Obs 15)]

Comments: ETC calculation 25164.8 shows that on the science target, 600 groups goes to 0.56 saturation in F1065.
ETC calculation 25164.9 shows that on the PSF reference, which is 0.5 mag brighter at K, comparable well depth is achieved in 400 groups. (As expected).

We follow a similar pattern for the other filters, scaling the number of groups down by 2/3 for the PSF reference to acheive comparable well depth.

*For the science target, we take a total of 8 integrations (4 per roll * 2 rolls). For the PSF star we are dithering the 9 point dither. It would be too expensive to take 8 integrations per each dither position. Instead we take only 2 integrations per dither position for a total of 18 integrations. If we oversimplfy and say that the subtracted PSF is a linear combination of 4 of the 9 dither positions, the SNR should be approximately comparable on the PSF star and science target. (This isn't a fully rigorous justification; experience will help show what works well in terms of balancing time when taking 9 point dithers.)*

Diagnostics

(GJ 758 F1065 roll 1 (Obs 1)) Warning (Form): The order of link [PA Offset 13 from 1] combined with the order of the SEQ NON-INT reduces scheduling flexibility.

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

(GJ 758 F1065 roll 1 (Obs 1)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GJ-758	RA: 19 23 34.0132 (290.8917217d)	Proper Motion RA: 81.966 mas/yr	
		Dec: +33 13 19.08 (33.22197d)	Proper Motion Dec: 160.158 mas/yr	
		Equinox: J2000	Parallax: 0.06407"	
			Epoch of Position: 2015.5	

Comments: Spectral type G9
K=4.493

Coordinates, PM, uncertainties and parallax updated to Gaia eDR3.

This is a moderately high proper motion star.
Category=Star
Description=[Exoplanets, G stars, Substellar companions]
Extended=NO

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1065C	MASK1065	4QPM	F1065C	FASTR1	600	4	1	1	4	575.951	25164.1

PSF References

HD 190360 F1065 (PSF star) (Obs 7) (PSF Reference; Filters [F1065C])

Additional Justification: false

Special Requirements

Aperture PA Range 173 to 183 Degrees (V3 168.16455103 to 178.16455103)
No Parallel Attachments

Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible
Aperture PA Offset 13 from 1 by 11 to 14 Degrees (Same offsets in V3)
Same Aperture PA 1, 2, 3

Observation

Proposal 1413, Observation 51: GJ 758 F1065 roll 1 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Comments: ETC calculation 25164.8 shows that on the science target, 600 groups goes to 0.56 saturation in F1065.
ETC calculation 25164.9 shows that on the PSF reference, which is 0.5 mag brighter at K, comparable well depth is achieved in 400 groups. (As expected).

We follow a similar pattern for the other filters, scaling the number of groups down by 2/3 for the PSF reference to acheive comparable well depth.

*For the science target, we take a total of 8 integrations (4 per roll * 2 rolls). For the PSF star we are dithering the 9 point dither. It would be too expensive to take 8 integrations per each dither position. Instead we take only 2 integrations per dither position for a total of 18 integrations. If we oversimplfy and say that the subtracted PSF is a linear combination of 4 of the 9 dither positions, the SNR should be approximately comparable on the PSF star and science target. (This isn't a fully rigorous justification; experience will help show what works well in terms of balancing time when taking 9 point dithers.)*

WOPR repeat of visit 1:1.

Diagnostics

(GJ 758 F1065 roll 1 (Obs 51)) Warning (Form): PSF Reference observations should be SEQ NON-INT.

(GJ 758 F1065 roll 1 (Obs 51)) Warning (Form): The order of link [PA Offset 54 from 51] combined with the order of the SEQ NON-INT reduces scheduling flexibility.

(Visit 51:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(GJ 758 F1065 roll 1 (Obs 51)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	GJ-758-revised	RA: 19 23 34.0132 (290.8917217d)	Proper Motion RA: 81.966 mas/yr	
		Dec: +33 13 19.08 (33.22197d)	Proper Motion Dec: 160.158 mas/yr	
		Equinox: J2000	Parallax: 0.0640703"	
			Epoch of Position: 2000	

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

2023-Aug-04: Epoch and equinox of RA/Dec values have both been updated to J2000.0 from Gaia EDR3, which is also the origin of the RA/Dec uncertainties, parallax, and proper motion values.
Category=Star
Description=[Exoplanets, G dwarfs, Substellar companions]

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1065C	MASK1065	4QPM	F1065C	FASTR1	600	4	1	1	4	575.951	25164.1

PSF References	HD 190360 F1065 (PSF star) (Obs 7) (PSF Reference; Filters [F1065C]) Additional Justification: false
Special Requirements	Aperture PA Range 76 to 100 Degrees (V3 71.16455103 to 95.16455103) Aperture PA Range 165 to 190 Degrees (V3 160.16455103 to 185.16455103) No Parallel Attachments Sequence Observations 51, 52, 53, 54, 55, 56, Non-interruptible Aperture PA Offset 54 from 51 by 10 to 14 Degrees (Same offsets in V3) Same Aperture PA 51, 52, 53

Observation

Proposal 1413, Observation 2: GJ 758 F1140 roll 1 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observations:[GJ 758 F1065 roll 1 (Obs 1), GJ 758 F1550 roll 1 (Obs 3), GJ 758 F1550 roll 1 BACKGROUND (Obs 4), GJ 758 F1140 roll 1 BACKGROUND (Obs 5), GJ 758 F1065 roll 1 BACKGROUND (Obs 6), GJ 758 F1065 roll 2 (Obs 13), GJ 758 F1140 roll 2 (Obs 14), GJ 758 F1550 roll 2 (Obs 15)]

Diagnostics

(GJ 758 F1140 roll 1 (Obs 2)) Warning (Form): The order of link [PA Offset 14 from 2] combined with the order of the SEQ NON-INT reduces scheduling flexibility.

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

(GJ 758 F1140 roll 1 (Obs 2)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GJ-758	RA: 19 23 34.0132 (290.8917217d) Dec: +33 13 19.08 (33.22197d) Equinox: J2000	Proper Motion RA: 81.966 mas/yr Proper Motion Dec: 160.158 mas/yr Parallax: 0.06407" Epoch of Position: 2015.5	

Comments: Spectral type G9
K=4.493

Coordinates, PM, uncertainties and parallax updated to Gaia eDR3.

This is a moderately high proper motion star.
Category=Star
Description=[Exoplanets, G stars, Substellar companions]
Extended=NO

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1140C	MASK1140	4QPM	F1140C	FASTR1	600	4	1	1	4	575.951	25164.2

PSF References	HD 190360 F1140 (PSF star) (Obs 8) (PSF Reference; Filters [F1140C]) Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible Aperture PA Offset 14 from 2 by 11 to 14 Degrees (Same offsets in V3) Same Aperture PA 1, 2, 3

Observation

Proposal 1413, Observation 52: GJ 758 F1140 roll 1 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Comments: WOPR repeat of visit 2:1.

Diagnostics

(GJ 758 F1140 roll 1 (Obs 52)) Warning (Form): PSF Reference observations should be SEQ NON-INT.

(GJ 758 F1140 roll 1 (Obs 52)) Warning (Form): Science observations should be linked to at least one other compatible science observation by an Aperture PA Offset of 1-14 degrees

(Visit 52:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(GJ 758 F1140 roll 1 (Obs 52)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	GJ-758-revised	RA: 19 23 34.0132 (290.8917217d) Dec: +33 13 19.08 (33.22197d) Equinox: J2000	Proper Motion RA: 81.966 mas/yr Proper Motion Dec: 160.158 mas/yr Parallax: 0.0640703" Epoch of Position: 2000	

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

2023-Aug-04: Epoch and equinox of RA/Dec values have both been updated to J2000.0 from Gaia EDR3, which is also the origin of the RA/Dec uncertainties, parallax, and proper motion values.
Category=Star
Description=[Exoplanets, G dwarfs, Substellar companions]

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1140C	MASK1140	4QPM	F1140C	FASTR1	600	4	1	1	4	575.951	25164.2

PSF References	HD 190360 F1140 (PSF star) (Obs 8) (PSF Reference; Filters [F1140C]) Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 51, 52, 53, 54, 55, 56, Non-interruptible Same Aperture PA 51, 52, 53

Observation

Proposal 1413, Observation 3: GJ 758 F1550 roll 1 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observations:[GJ 758 F1065 roll 1 (Obs 1), GJ 758 F1140 roll 1 (Obs 2), GJ 758 F1550 roll 1 BACKGROUND (Obs 4), GJ 758 F1140 roll 1 BACKGROUND (Obs 5), GJ 758 F1065 roll 1 BACKGROUND (Obs 6), GJ 758 F1065 roll 2 (Obs 13), GJ 758 F1140 roll 2 (Obs 14), GJ 758 F1550 roll 2 (Obs 15)]

Diagnostics

(GJ 758 F1550 roll 1 (Obs 3)) Warning (Form): The order of link [PA Offset 15 from 3] combined with the order of the SEQ NON-INT reduces scheduling flexibility.

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

(GJ 758 F1550 roll 1 (Obs 3)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GJ-758	RA: 19 23 34.0132 (290.8917217d) Dec: +33 13 19.08 (33.22197d) Equinox: J2000	Proper Motion RA: 81.966 mas/yr Proper Motion Dec: 160.158 mas/yr Parallax: 0.06407" Epoch of Position: 2015.5	

Comments: Spectral type G9
K=4.493

Coordinates, PM, uncertainties and parallax updated to Gaia eDR3.

This is a moderately high proper motion star.
Category=Star
Description=[Exoplanets, G stars, Substellar companions]
Extended=NO

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1550C	MASK1550	4QPM	F1550C	FASTR1	600	6	1	1	6	864.046	25164.2

PSF References	HD 190360 F1550 (PSF star) (Obs 9) (PSF Reference; Filters [F1550C]) Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible Aperture PA Offset 15 from 3 by 11 to 14 Degrees (Same offsets in V3) Same Aperture PA 1, 2, 3

Observation

Proposal 1413, Observation 53: GJ 758 F1550 roll 1 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Comments: WOPR Repeat of visit 3:1.

Diagnostics

(GJ 758 F1550 roll 1 (Obs 53)) Warning (Form): PSF Reference observations should be SEQ NON-INT.

(GJ 758 F1550 roll 1 (Obs 53)) Warning (Form): Science observations should be linked to at least one other compatible science observation by an Aperture PA Offset of 1-14 degrees

(Visit 53:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(GJ 758 F1550 roll 1 (Obs 53)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	GJ-758-revised	RA: 19 23 34.0132 (290.8917217d) Dec: +33 13 19.08 (33.22197d) Equinox: J2000	Proper Motion RA: 81.966 mas/yr Proper Motion Dec: 160.158 mas/yr Parallax: 0.0640703" Epoch of Position: 2000	

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

2023-Aug-04: Epoch and equinox of RA/Dec values have both been updated to J2000.0 from Gaia EDR3, which is also the origin of the RA/Dec uncertainties, parallax, and proper motion values.
Category=Star
Description=[Exoplanets, G dwarfs, Substellar companions]

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1550C	MASK1550	4QPM	F1550C	FASTR1	600	6	1	1	6	864.046	25164.2

PSF References	HD 190360 F1550 (PSF star) (Obs 9) (PSF Reference; Filters [F1550C]) Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 51, 52, 53, 54, 55, 56, Non-interruptible Same Aperture PA 51, 52, 53

Observation

Proposal 1413, Observation 4: GJ 758 F1550 roll 1 BACKGROUND Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observation For: [GJ 758 F1065 roll 1 (Obs 1), GJ 758 F1140 roll 1 (Obs 2), GJ 758 F1550 roll 1 (Obs 3), GJ 758 F1065 roll 2 (Obs 13), GJ 758 F1140 roll 2 (Obs 14), GJ 758 F1550 roll 2 (Obs 15)]

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
(3)	GJ-758-Background	RA: 19 23 42.5000 (290.9270833d) Dec: +33 13 15.00 (33.22083d) Equinox: J2000		

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

Acquisition

#	Target
1	NONE

Template

AcqFilter	Repeat observation	Background Quadrant
FND	YES	1

Dithers

#	Dither Type
1	BACKGROUND

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1550C	MASK1550	4QPM	F1550C	FASTR1	600	6	1	2	12	1728.093	25164.2

PSF References

Additional Justification: false

Special Requirements	
	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible

Observation

Proposal 1413, Observation 5: GJ 758 F1140 roll 1 BACKGROUND Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observation For: [GJ 758 F1065 roll 1 (Obs 1), GJ 758 F1140 roll 1 (Obs 2), GJ 758 F1550 roll 1 (Obs 3), GJ 758 F1065 roll 2 (Obs 13), GJ 758 F1140 roll 2 (Obs 14), GJ 758 F1550 roll 2 (Obs 15)]

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
(3)	GJ-758-Background	RA: 19 23 42.5000 (290.9270833d) Dec: +33 13 15.00 (33.22083d) Equinox: J2000		

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

Acquisition

#	Target
1	NONE

Template

AcqFilter	Repeat observation	Background Quadrant
FND	YES	1

Dithers

#	Dither Type
1	BACKGROUND

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1140C	MASK1140	4QPM	F1140C	FASTR1	600	4	1	2	8	1151.902	25164.2

PSF References

Additional Justification: false

Special Requirements	
	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible

Observation

Proposal 1413, Observation 6: GJ 758 F1065 roll 1 BACKGROUND Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observation For: [GJ 758 F1065 roll 1 (Obs 1), GJ 758 F1140 roll 1 (Obs 2), GJ 758 F1550 roll 1 (Obs 3), GJ 758 F1065 roll 2 (Obs 13), GJ 758 F1140 roll 2 (Obs 14), GJ 758 F1550 roll 2 (Obs 15)]

Comments: ETC calculation 25164.8 shows that on the science target, 600 groups goes to 0.56 saturation in F1065.
ETC calculation 25164.9 shows that on the PSF reference, which is 0.5 mag brighter at K, comparable well depth is achieved in 400 groups. (As expected).

We follow a similar pattern for the other filters, scaling the number of groups down by 2/3 for the PSF reference to acheive comparable well depth.

*For the science target, we take a total of 8 integrations (4 per roll * 2 rolls). For the PSF star we are dithering the 9 point dither. It would be too expensive to take 8 integrations per each dither position. Instead we take only 2 integrations per dither position for a total of 18 integrations. If we oversimplfy and say that the subtracted PSF is a linear combination of 4 of the 9 dither positions, the SNR should be approximately comparable on the PSF star and science target. (This isn't a fully rigorous justification; experience will help show what works well in terms of balancing time when taking 9 point dithers.)*

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
(3)	GJ-758-Background	RA: 19 23 42.5000 (290.9270833d) Dec: +33 13 15.00 (33.22083d) Equinox: J2000		

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

Acquisition

#	Target
1	NONE

Template

AcqFilter	Repeat observation	Background Quadrant
FND	YES	1

Dithers

#	Dither Type
1	BACKGROUND

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1065C	MASK1065	4QPM	F1065C	FASTR1	600	4	1	2	8	1151.902	25164.1

PSF References	Additional Justification: false
Special Requirements	Aperture PA Range 173 to 183 Degrees (V3 168.16455103 to 178.16455103) No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible

Observation

Proposal 1413, Observation 7: HD 190360 F1065 (PSF star) Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observations:[HD 190360 F1140 (PSF star) (Obs 8), HD 190360 F1550 (PSF star) (Obs 9), HD 190360 F1550 (PSF star) BACKGROUND (Obs 10), HD 190360 F1140 (PSF star) BACKGROUND (Obs 11), HD 190360 F1065 (PSF star) BACKGROUND (Obs 12)]

Comments: ETC calculation 25164.8 shows that on the science target, 600 groups goes to 0.56 saturation in F1065.
ETC calculation 25164.9 shows that on the PSF reference, which is 0.5 mag brighter at K, comparable well depth is achieved in 400 groups. (As expected).

We follow a similar pattern for the other filters, scaling the number of groups down by 2/3 for the PSF reference to acheive comparable well depth.

*For the science target, we take a total of 8 integrations (4 per roll * 2 rolls). For the PSF star we are dithering the 9 point dither. It would be too expensive to take 8 integrations per each dither position. Instead we take only 2 integrations per dither position for a total of 18 integrations. If we oversimplfy and say that the subtracted PSF is a linear combination of 4 of the 9 dither positions, the SNR should be approximately comparable on the PSF star and science target. (This isn't a fully rigorous justification; experience will help show what works well in terms of balancing time when taking 9 point dithers.)*

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
(2)	HD-190360	RA: 20 03 37.4053 (300.9058554d)	Proper Motion RA: 683.035 mas/yr	
		Dec: +29 53 48.49 (29.89680d)	Proper Motion Dec: -525.309 mas/yr	
		Equinox: J2000	Parallax: 0.06306"	
			Epoch of Position: 2000.0	

Comments: Spectral type G7
K=4.076

Coordinates, PM, and uncertainties updated to Gaia DR1. Parallax is still from Hipparcos.

Note, this is a high proper motion star!
Category=Star
Description=[Exoplanets, G stars]
Extended=NO

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	12954.7

Template

Repeat observation
NO

Dithers

#	Dither Type
1	9-POINT-SMALL-GRID

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1065C	MASK1065	4QPM	F1065C	FASTR1	408	2	1	9	18	1762.367	12954.1

PSF References

PSF Reference: true

Special Requirements

No Parallel Attachments

Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible

Observation

Proposal 1413, Observation 8: HD 190360 F1140 (PSF star) Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observations:[HD 190360 F1065 (PSF star) (Obs 7), HD 190360 F1550 (PSF star) (Obs 9), HD 190360 F1550 (PSF star) BACKGROUND (Obs 10), HD 190360 F1140 (PSF star) BACKGROUND (Obs 11), HD 190360 F1065 (PSF star) BACKGROUND (Obs 12)]

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
(2)	HD-190360	RA: 20 03 37.4053 (300.9058554d) Dec: +29 53 48.49 (29.89680d) Equinox: J2000	Proper Motion RA: 683.035 mas/yr Proper Motion Dec: -525.309 mas/yr Parallax: 0.06306" Epoch of Position: 2000.0	

Comments: Spectral type G7
K=4.076

Coordinates, PM, and uncertainties updated to Gaia DR1. Parallax is still from Hipparcos.

Note, this is a high proper motion star!
Category=Star
Description=[Exoplanets, G stars]
Extended=NO

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	12954.7

Template

Repeat observation
NO

Dithers

#	Dither Type
1	9-POINT-SMALL-GRID

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1140C	MASK1140	4QPM	F1140C	FASTR1	408	2	1	9	18	1762.367	12954.2

PSF References	PSF Reference: true
Special Requirements	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible

Observation

Proposal 1413, Observation 9: HD 190360 F1550 (PSF star) Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observations:[HD 190360 F1065 (PSF star) (Obs 7), HD 190360 F1140 (PSF star) (Obs 8), HD 190360 F1550 (PSF star) BACKGROUND (Obs 10), HD 190360 F1140 (PSF star) BACKGROUND (Obs 11), HD 190360 F1065 (PSF star) BACKGROUND (Obs 12)]

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
(2)	HD-190360	RA: 20 03 37.4053 (300.9058554d) Dec: +29 53 48.49 (29.89680d) Equinox: J2000	Proper Motion RA: 683.035 mas/yr Proper Motion Dec: -525.309 mas/yr Parallax: 0.06306" Epoch of Position: 2000.0	

Comments: Spectral type G7
K=4.076

Coordinates, PM, and uncertainties updated to Gaia DR1. Parallax is still from Hipparcos.

Note, this is a high proper motion star!
Category=Star
Description=[Exoplanets, G stars]
Extended=NO

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	12954.7

Template

Repeat observation
NO

Dithers

#	Dither Type
1	9-POINT-SMALL-GRID

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1550C	MASK1550	4QPM	F1550C	FASTR1	408	3	1	9	27	2644.629	12954.3

PSF References	PSF Reference: true
Special Requirements	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible

Observation

Proposal 1413, Observation 10: HD 190360 F1550 (PSF star) BACKGROUND Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observation For: [HD 190360 F1065 (PSF star) (Obs 7), HD 190360 F1140 (PSF star) (Obs 8), HD 190360 F1550 (PSF star) (Obs 9)]

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
(4)	HD-190360-BACKGROUND	RA: 20 03 42.0000 (300.9250000d) Dec: +29 55 53.50 (29.93153d) Equinox: J2000		

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

Acquisition

#	Target
1	NONE

Template

AcqFilter	Repeat observation	Background Quadrant
FND	YES	1

Dithers

#	Dither Type
1	BACKGROUND

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1550C	MASK1550	4QPM	F1550C	FASTR1	408	3	1	2	6	587.695	12954.3

PSF References

Additional Justification: false

Special Requirements	
	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible

Observation

Proposal 1413, Observation 11: HD 190360 F1140 (PSF star) BACKGROUND Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observation For: [HD 190360 F1065 (PSF star) (Obs 7), HD 190360 F1140 (PSF star) (Obs 8), HD 190360 F1550 (PSF star) (Obs 9)]

Diagnostics

(Visit 11:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	HD-190360-BACKGROUND	RA: 20 03 42.0000 (300.9250000d) Dec: +29 55 53.50 (29.93153d) Equinox: J2000		

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

Acquisition

#	Target
1	NONE

Template

AcqFilter	Repeat observation	Background Quadrant
FND	YES	1

Dithers

#	Dither Type
1	BACKGROUND

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1140C	MASK1140	4QPM	F1140C	FASTR1	408	2	1	2	4	391.637	12954.2

PSF References

Additional Justification: false

Special Requirements	
	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible

Observation

Proposal 1413, Observation 12: HD 190360 F1065 (PSF star) BACKGROUND Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observation For: [HD 190360 F1065 (PSF star) (Obs 7), HD 190360 F1140 (PSF star) (Obs 8), HD 190360 F1550 (PSF star) (Obs 9)]

Comments: ETC calculation 25164.8 shows that on the science target, 600 groups goes to 0.56 saturation in F1065.
ETC calculation 25164.9 shows that on the PSF reference, which is 0.5 mag brighter at K, comparable well depth is achieved in 400 groups. (As expected).

We follow a similar pattern for the other filters, scaling the number of groups down by 2/3 for the PSF reference to acheive comparable well depth.

*For the science target, we take a total of 8 integrations (4 per roll * 2 rolls). For the PSF star we are dithering the 9 point dither. It would be too expensive to take 8 integrations per each dither position. Instead we take only 2 integrations per dither position for a total of 18 integrations. If we oversimplfy and say that the subtracted PSF is a linear combination of 4 of the 9 dither positions, the SNR should be approximately comparable on the PSF star and science target. (This isn't a fully rigorous justification; experience will help show what works well in terms of balancing time when taking 9 point dithers.)*

Diagnostics

(Visit 12:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	HD-190360-BACKGROUND	RA: 20 03 42.0000 (300.9250000d) Dec: +29 55 53.50 (29.93153d) Equinox: J2000		

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

Acquisition

#	Target
1	NONE

Template

AcqFilter	Repeat observation	Background Quadrant
FND	YES	1

Dithers

#	Dither Type
1	BACKGROUND

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1065C	MASK1065	4QPM	F1065C	FASTR1	408	2	1	2	4	391.637	12954.1

PSF References	Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible

Observation

Proposal 1413, Observation 13: GJ 758 F1065 roll 2 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observations:[GJ 758 F1065 roll 1 (Obs 1), GJ 758 F1140 roll 1 (Obs 2), GJ 758 F1550 roll 1 (Obs 3), GJ 758 F1550 roll 1 BACKGROUND (Obs 4), GJ 758 F1140 roll 1 BACKGROUND (Obs 5), GJ 758 F1065 roll 1 BACKGROUND (Obs 6), GJ 758 F1140 roll 2 (Obs 14), GJ 758 F1550 roll 2 (Obs 15)]

Diagnostics

(GJ 758 F1065 roll 2 (Obs 13)) Warning (Form): The order of link [PA Offset 13 from 1] combined with the order of the SEQ NON-INT reduces scheduling flexibility.

(Visit 13:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(GJ 758 F1065 roll 2 (Obs 13)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GJ-758	RA: 19 23 34.0132 (290.8917217d)	Proper Motion RA: 81.966 mas/yr	
		Dec: +33 13 19.08 (33.22197d)	Proper Motion Dec: 160.158 mas/yr	
		Equinox: J2000	Parallax: 0.06407"	
			Epoch of Position: 2015.5	

Comments: Spectral type G9
K=4.493

Coordinates, PM, uncertainties and parallax updated to Gaia eDR3.

This is a moderately high proper motion star.
Category=Star
Description=[Exoplanets, G stars, Substellar companions]
Extended=NO

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1065C	MASK1065	4QPM	F1065C	FASTR1	600	4	1	1	4	575.951	25164.1

PSF References	HD 190360 F1065 (PSF star) (Obs 7) (PSF Reference; Filters [F1065C]) Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible Aperture PA Offset 13 from 1 by 11 to 14 Degrees (Same offsets in V3) Same Aperture PA 13, 14, 15

Observation

Proposal 1413, Observation 54: GJ 758 F1065 roll 2 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Comments: WOPR repeat of visit 13:1.

Diagnostics

(GJ 758 F1065 roll 2 (Obs 54)) Warning (Form): PSF Reference observations should be SEQ NON-INT.

(GJ 758 F1065 roll 2 (Obs 54)) Warning (Form): The order of link [PA Offset 54 from 51] combined with the order of the SEQ NON-INT reduces scheduling flexibility.

(Visit 54:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(GJ 758 F1065 roll 2 (Obs 54)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	GJ-758-revised	RA: 19 23 34.0132 (290.8917217d) Dec: +33 13 19.08 (33.22197d) Equinox: J2000	Proper Motion RA: 81.966 mas/yr Proper Motion Dec: 160.158 mas/yr Parallax: 0.0640703" Epoch of Position: 2000	

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

2023-Aug-04: Epoch and equinox of RA/Dec values have both been updated to J2000.0 from Gaia EDR3, which is also the origin of the RA/Dec uncertainties, parallax, and proper motion values.
Category=Star
Description=[Exoplanets, G dwarfs, Substellar companions]

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1065C	MASK1065	4QPM	F1065C	FASTR1	600	4	1	1	4	575.951	25164.1

PSF References	HD 190360 F1065 (PSF star) (Obs 7) (PSF Reference; Filters [F1065C]) Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 51, 52, 53, 54, 55, 56, Non-interruptible Aperture PA Offset 54 from 51 by 10 to 14 Degrees (Same offsets in V3) Same Aperture PA 54, 55, 56

Observation

Proposal 1413, Observation 14: GJ 758 F1140 roll 2 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observations:[GJ 758 F1065 roll 1 (Obs 1), GJ 758 F1140 roll 1 (Obs 2), GJ 758 F1550 roll 1 (Obs 3), GJ 758 F1550 roll 1 BACKGROUND (Obs 4), GJ 758 F1140 roll 1 BACKGROUND (Obs 5), GJ 758 F1065 roll 1 BACKGROUND (Obs 6), GJ 758 F1065 roll 2 (Obs 13), GJ 758 F1550 roll 2 (Obs 15)]

Diagnostics

(GJ 758 F1140 roll 2 (Obs 14)) Warning (Form): The order of link [PA Offset 14 from 2] combined with the order of the SEQ NON-INT reduces scheduling flexibility.

(Visit 14:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(GJ 758 F1140 roll 2 (Obs 14)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GJ-758	RA: 19 23 34.0132 (290.8917217d) Dec: +33 13 19.08 (33.22197d) Equinox: J2000	Proper Motion RA: 81.966 mas/yr Proper Motion Dec: 160.158 mas/yr Parallax: 0.06407" Epoch of Position: 2015.5	

Comments: Spectral type G9
K=4.493

Coordinates, PM, uncertainties and parallax updated to Gaia eDR3.

This is a moderately high proper motion star.
Category=Star
Description=[Exoplanets, G stars, Substellar companions]
Extended=NO

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1140C	MASK1140	4QPM	F1140C	FASTR1	600	4	1	1	4	575.951	25164.2

PSF References	HD 190360 F1140 (PSF star) (Obs 8) (PSF Reference; Filters [F1140C]) Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible Aperture PA Offset 14 from 2 by 11 to 14 Degrees (Same offsets in V3) Same Aperture PA 13, 14, 15

Observation

Proposal 1413, Observation 55: GJ 758 F1140 roll 2 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Comments: WOPR repeat of obs 14:1.

Diagnostics

(GJ 758 F1140 roll 2 (Obs 55)) Warning (Form): PSF Reference observations should be SEQ NON-INT.

(GJ 758 F1140 roll 2 (Obs 55)) Warning (Form): Science observations should be linked to at least one other compatible science observation by an Aperture PA Offset of 1-14 degrees

(Visit 55:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(GJ 758 F1140 roll 2 (Obs 55)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	GJ-758-revised	RA: 19 23 34.0132 (290.8917217d) Dec: +33 13 19.08 (33.22197d) Equinox: J2000	Proper Motion RA: 81.966 mas/yr Proper Motion Dec: 160.158 mas/yr Parallax: 0.0640703" Epoch of Position: 2000	

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

2023-Aug-04: Epoch and equinox of RA/Dec values have both been updated to J2000.0 from Gaia EDR3, which is also the origin of the RA/Dec uncertainties, parallax, and proper motion values.
Category=Star
Description=[Exoplanets, G dwarfs, Substellar companions]

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1140C	MASK1140	4QPM	F1140C	FASTR1	600	4	1	1	4	575.951	25164.2

PSF References	HD 190360 F1140 (PSF star) (Obs 8) (PSF Reference; Filters [F1140C]) Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 51, 52, 53, 54, 55, 56, Non-interruptible Same Aperture PA 54, 55, 56

Observation

Proposal 1413, Observation 15: GJ 758 F1550 roll 2 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Background Observations:[GJ 758 F1065 roll 1 (Obs 1), GJ 758 F1140 roll 1 (Obs 2), GJ 758 F1550 roll 1 (Obs 3), GJ 758 F1550 roll 1 BACKGROUND (Obs 4), GJ 758 F1140 roll 1 BACKGROUND (Obs 5), GJ 758 F1065 roll 1 BACKGROUND (Obs 6), GJ 758 F1065 roll 2 (Obs 13), GJ 758 F1140 roll 2 (Obs 14)]

Diagnostics

(GJ 758 F1550 roll 2 (Obs 15)) Warning (Form): The order of link [PA Offset 15 from 3] combined with the order of the SEQ NON-INT reduces scheduling flexibility.

(Visit 15:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(GJ 758 F1550 roll 2 (Obs 15)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GJ-758	RA: 19 23 34.0132 (290.8917217d)	Proper Motion RA: 81.966 mas/yr	
		Dec: +33 13 19.08 (33.22197d)	Proper Motion Dec: 160.158 mas/yr	
		Equinox: J2000	Parallax: 0.06407"	
			Epoch of Position: 2015.5	

Comments: Spectral type G9
K=4.493

Coordinates, PM, uncertainties and parallax updated to Gaia eDR3.

This is a moderately high proper motion star.
Category=Star
Description=[Exoplanets, G stars, Substellar companions]
Extended=NO

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1550C	MASK1550	4QPM	F1550C	FASTR1	600	6	1	1	6	864.046	25164.3

PSF References	HD 190360 F1550 (PSF star) (Obs 9) (PSF Reference; Filters [F1550C]) Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Non-interruptible Aperture PA Offset 15 from 3 by 11 to 14 Degrees (Same offsets in V3) Same Aperture PA 13, 14, 15

Observation

Proposal 1413, Observation 56: GJ 758 F1550 roll 2 Fri Aug 04 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Coronagraphic Imaging

Comments: WOPR Repeat of visit 15:1

Diagnostics

(GJ 758 F1550 roll 2 (Obs 56)) Warning (Form): PSF Reference observations should be SEQ NON-INT.

(GJ 758 F1550 roll 2 (Obs 56)) Warning (Form): Science observations should be linked to at least one other compatible science observation by an Aperture PA Offset of 1-14 degrees

(Visit 56:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(GJ 758 F1550 roll 2 (Obs 56)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	GJ-758-revised	RA: 19 23 34.0132 (290.8917217d) Dec: +33 13 19.08 (33.22197d) Equinox: J2000	Proper Motion RA: 81.966 mas/yr Proper Motion Dec: 160.158 mas/yr Parallax: 0.0640703" Epoch of Position: 2000	

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

2023-Aug-04: Epoch and equinox of RA/Dec values have both been updated to J2000.0 from Gaia EDR3, which is also the origin of the RA/Dec uncertainties, parallax, and proper motion values.
Category=Star
Description=[Exoplanets, G dwarfs, Substellar companions]

Acquisition

#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	FND	1	FAST	36	1	1	8.628	25164.6

Template

Repeat observation
NO

Dithers

#	Dither Type
1	NONE

Spectral Elements

#	Coron Mask/Filter	Subarray	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4QPM/F1550C	MASK1550	4QPM	F1550C	FASTR1	600	6	1	1	6	864.046	25164.3

PSF References	HD 190360 F1550 (PSF star) (Obs 9) (PSF Reference; Filters [F1550C]) Additional Justification: false
Special Requirements	No Parallel Attachments Sequence Observations 51, 52, 53, 54, 55, 56, Non-interruptible Same Aperture PA 54, 55, 56