



**HAL**  
open science

## Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

Dimitri Mawet, Marie Ygouf, Jarron Michael Leisenring, K Thomas, Michael E Ressler, Gene Serabyn, Anthony Boccaletti, Renyu Hu, Jorge Llop-Sayson, Laurent Pueyo, et al.

► **To cite this version:**

Dimitri Mawet, Marie Ygouf, Jarron Michael Leisenring, K Thomas, Michael E Ressler, et al.. Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission. 2021. hal-03445893

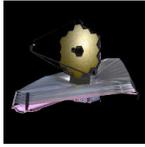
**HAL Id: hal-03445893**

**<https://hal.science/hal-03445893>**

Preprint submitted on 24 Nov 2021

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



# 1618 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

Cycle: 1, Proposal Category: GO

## INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
<b>Dr. Charles A. Beichman (PI)</b>	<b>Jet Propulsion Laboratory</b>	<b>charles.a.beichman@jpl.nasa.gov</b>
Dr. Dimitri Mawet (CoI) (CoPI)	California Institute of Technology	dmawet@astro.caltech.edu
Dr. Marie Ygouf (CoI)	Jet Propulsion Laboratory	marie.ygouf@jpl.nasa.gov
Dr. Jarron Michael Leisenring (CoI)	University of Arizona	jarronl@email.arizona.edu
Prof. Thomas K. Henning (CoI) (ESA Member)	Max-Planck-Institut fur Astronomie, Heidelberg	henning@mpia-hd.mpg.de
Dr. Michael E. Ressler (CoI)	Jet Propulsion Laboratory	ressler@jpl.nasa.gov
Dr. Gene Serabyn (CoI)	Jet Propulsion Laboratory	eugene.serabyn@jpl.nasa.gov
Dr. Anthony Boccaletti (CoI) (ESA Member)	Observatoire de Paris - Section de Meudon	anthony.boccaletti@obspm.fr
Dr. Elodie Choquet (CoI) (ESA Member)	Laboratoire d'Astrophysique de Marseille	elodie.choquet@lam.fr
Dr. Renyu Hu (CoI)	Jet Propulsion Laboratory	renyu.hu@jpl.nasa.gov
Prof. Pierre Kervella (CoI) (ESA Member)	Observatoire de Paris	pierre.kervella@obspm.fr
Jorge Llop-Sayson (CoI)	California Institute of Technology	jllopsay@caltech.edu
Dr. Laurent Pueyo (CoI)	Space Telescope Science Institute	pueyo@stsci.edu
Dr. Billy Quarles (CoI)	Georgia Tech Research Corp.	billylquarles@gmail.com
Dr. Kevin Wagner (CoI)	University of Arizona	kevinwagner@email.arizona.edu
Prof. Mark Wyatt (CoI) (ESA Member)	University of Cambridge	wyatt@ast.cam.ac.uk
Dr. Ruslan Belikov (CoI)	NASA Ames Research Center	ruslan.belikov@nasa.gov
Dr. Pierre-Olivier Lagage (CoI) (ESA Member)	Commissariat a l'Energie Atomique (CEA)	pierre-olivier.lagage@cea.fr

## OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Alpha Cen A				

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
	1	eps Mus Position A. use offset star	MIRI Coronagraphic Imaging	(3) EPS-MUS-OFFSET
	5	eps Mus position B use offset star	MIRI Coronagraphic Imaging	(3) EPS-MUS-OFFSET
	2	Alpha Cen A F1550	MIRI Coronagraphic Imaging	(4) ALPHACENOFFSET
	3	Alpha Cen A F1550	MIRI Coronagraphic Imaging	(4) ALPHACENOFFSET
	4	offset star for eps Mus. Position A. Obs 2	MIRI Coronagraphic Imaging	(3) EPS-MUS-OFFSET
	6	offset star for eps Mus. Position B. Obs 2	MIRI Coronagraphic Imaging	(3) EPS-MUS-OFFSET

## ABSTRACT

Alpha Centauri A is the closest solar-type star to the Sun and offers an unique opportunity to detect both a mature gas giant planet (consistent with existing radial velocity constraints) and a zodiacal dust cloud. A carefully planned observational sequence using the MIRI Coronagraph (F1550C) and innovative post-processing would be sensitive down to a radius limit of 0.5~0.7 R-Jupiter for planets within ~3 AU (~2.5") around alpha Cen A where models predict a region of stability against disruption by alpha Cen B. These same observations would be sensitive to a level of zodiacal emission only a few times brighter than that of the Sun's, an unprecedented level not even achieved by ground based interferometers. The proposed observations would probe the limit of JWST high contrast imaging on a star that offers the best chance for the ultimate detection of Earth analogs by future ground and/or space based facilities. The experiment is admittedly high risk, but the prospect of directly imaging a planet around our closest stellar neighbor is an exciting one.

## OBSERVING DESCRIPTION

The proposed scenario brackets the observations of alpha Cen with observations of a PSF reference star, eps Muscae, of comparable brightness to alpha Cen A. The date of the observation has been selected to minimize the change in pitch angle (solar offset) between the target and reference star so as to minimize changes in telescope's thermal environment.

Eps Mus will be observed with a 5 point dither pattern at the position of alpha Cen A behind the coronagraphic mask to increase the image diversity for improved PSF reconstruction. Eps Mus will also be observed at the position alpha Cen B without a dither pattern. We recognize that neither eps Mus (in this position) nor alpha Cen B will be behind the coronagraph which will result in saturating the cores of the PSF, but analysis of the post-processing shows that it is important to measure the speckle pattern from alpha Cen B near the position of alpha Cen A. The observation of alpha Cen is split to avoid the limit of 10,000 seconds for an individual observation.

Target acquisition (TA) for both alpha Cen and the PSF reference star eps Mus will be challenging due to two factors: 1) both stars are extremely bright and would saturate during the TA process; 2) the position of alpha Cen A is changing by up to 10 mas per day due to its combined proper motion, parallax and orbital motion. We address the first point for both stars by using nearby Gaia stars as the initial targets to be followed by an offset to the desired science or reference target. Offsets are given in the sense (alpha CenRA/DEC-OffsetStarRA/DEC) after rotation into the camera coordinate system. The Gaia stars and eps Mus have highly precise Gaia positions and proper motions. We will address the evolving position of alpha Cen A using the ALMA astrometry obtained by Akeson et al (2020) and update the offsets once the exact date of the observation is known. It may eventually prove necessary to treat alpha Cen as a moving target so as to mitigate its motion during the 5 hours of its observation (~0.4 mas/hr).

The offset star for alpha Cen A is a Gaia star located 16" (13") away in 2022 (2023) away with an inferred K magnitude (from Gaia colors) of K=13.6. It is observed in TA for FQPM/F1550 mode with F560W and achieves SNR~140 in 15 sec. The offset star for eps Mus is a Gaia star located 25" away with an inferred K magnitude (from Gaia colors) of K=11.4. It is observed in TA for FQPM/F1550 mode with F560W and achieves SNR~32 in 8 sec.

A number of interloper stars will approach alpha Cen A during the next few years due to alpha Cen's large proper motion. One is quite faint (S2) and is a minor issue in 2022-23. A second (S5) is significantly brighter and becomes a more serious issue in 2026 and beyond. For this reason we want to schedule the observations as early as possible to ensure the maximum areal coverage for exoplanet discovery and the potential for future follow-up observations.

We have elected to NOT use two roll angles since we are expecting to find planets within only the central 1-2" where the 2nd roll offers no advantage and would require a considerable overhead in total clock time.

Proposal 1618 - Targets - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	EPS-MUS-OFFSET	RA: 12 17 34.6051 (184.3941879d) Dec: -67 57 13.07 (-67.95363d) Equinox: J2000	Proper Motion RA: -7.09 mas/yr Proper Motion Dec: 0.496 mas/yr Parallax: 0.00013" Epoch of Position: 2015.5	
<i>Comments:</i> <i>Category=Calibration</i> <i>Description=[Target acquisition test]</i> <i>Extended=NO</i>				
(4)	ALPHACENOFFSET	RA: 14 39 22.3404 (219.8430850d) Dec: -60 50 0.78 (-60.83355d) Equinox: J2000	Proper Motion RA: -8.2 mas/yr Proper Motion Dec: -1.88 mas/yr Parallax: 0.0001" Epoch of Position: 2015.5	
<i>Comments:</i> <i>Category=Calibration</i> <i>Description=[Target acquisition test]</i> <i>Extended=NO</i>				

Fixed Targets

Proposal 1618 - Observation 1 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

Fri Aug 27 21:00:15 GMT 2021

<b>Observation</b>	<p><b>Proposal 1618, Observation 1: eps Mus Position A. use offset star</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: MIRI Coronagraphic Imaging</p> <p><i>Comments: Target acquisition (TA) for both alpha Cen and the PSF reference star eps Mus will be challenging due to two factors: 1) both stars are extremely bright and would saturate during the TA process; 2) the position of alpha Cen is changing by up to 10 mas per day due to its proper motion, parallax and orbital motion. We address the first point for both stars by using nearby Gaia stars as the initial target to be followed by an offset to the desired science target. Offsets are given in the sense (alpha CenRA/DEC-OffsetStarRA/DEC) after rotation into the camera coordinate system. The Gaia stars and eps Mus have highly precise Gaia positions and proper motion values. We will address the evolving position of alpha Cen A using the ALMA astrometry obtained by Akeson et al (2020) and update the offsets once the exact date of the observation. It may eventually prove necessary to treat alpha Cen as a moving target so as to mitigate its motion during the 5 hours of its observation.</i></p> <p><i>This TA positions eps mus behind the coronagrphic mask</i></p>											
	<p>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>											
<b>Diagnosics</b>												
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>			<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>			
	(3)	EPS-MUS-OFFSET	RA: 12 17 34.6051 (184.3941879d) Dec: -67 57 13.07 (-67.95363d) Equinox: J2000			Proper Motion RA: -7.09 mas/yr Proper Motion Dec: 0.496 mas/yr Parallax: 0.00013" Epoch of Position: 2015.5						
<p><i>Comments:</i>                      Category=Calibration                      Description=[Target acquisition test]                      Extended=NO</p>												
<b>Acquisition</b>	<b>#</b>	<b>Target</b>	<b>Filter</b>	<b>Quadrant</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>		
	1	SAME	F560W	1	FASTGRPAVG8	4	1	1	7.67	59296.14		
<b>Template</b>	<b>Repeat observation</b>											
	NO											
<b>Dithers</b>	<b>#</b>	<b>Dither Type</b>										
	1	5-POINT-SMALL-GRID										
<b>Spectral Elements</b>	<b>#</b>	<b>Coron Mask/Filter</b>	<b>Mask</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	4QPM/F1550C	4QPM	F1550C	FASTR1	30	550	1	5	2750	20431.522	59296.4

Proposal 1618 - Observation 1 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

<b>PSF References</b>	PSF Reference: true
<b>Special Requirements</b>	Offset 25.3847 arcsec, -3.6256 arcsec No Parallel Sequence Observations 1, 2, 3, 4, 5, 6, Non-interruptible

Proposal 1618 - Observation 5 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

Fri Aug 27 21:00:15 GMT 2021

<b>Observation</b>	<p><b>Proposal 1618, Observation 5: eps Mus position B use offset star</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: MIRI Coronagraphic Imaging</p> <p><i>Comments: Target acquisition (TA) for both alpha Cen and the PSF reference star eps Mus will be challenging due to two factors: 1) both stars are extremely bright and would saturate during the TA process; 2) the position of alpha Cen is changing by up to 10 mas per day due to its proper motion, parallax and orbital motion. We address the first point for both stars by using nearby Gaia stars as the initial target to be followed by an offset to the desired science target. Offsets are given in the sense (alpha CenRA/DEC-OffsetStarRA/DEC) after rotation into the camera coordinate system. The Gaia stars and eps Mus have highly precise Gaia positions and proper motion values. We will address the evolving position of alpha Cen A using the ALMA astrometry obtained by Akeson et al (2020) and update the offsets once the exact date of the observation. It may eventually prove necessary to treat alpha Cen as a moving target so as to mitigate its motion during the 5 hours of its observation.</i></p> <p><i>This observations positions eps Mus at the future position of alpha cen which will NOT be behind the mask</i></p>											
	<p>(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>											
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>			<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>			
	(3)	EPS-MUS-OFFSET	RA: 12 17 34.6051 (184.3941879d) Dec: -67 57 13.07 (-67.95363d) Equinox: J2000			Proper Motion RA: -7.09 mas/yr Proper Motion Dec: 0.496 mas/yr Parallax: 0.00013" Epoch of Position: 2015.5						
<p><i>Comments:</i>                      Category=Calibration                      Description=[Target acquisition test]                      Extended=NO</p>												
<b>Acquisition</b>	<b>#</b>	<b>Target</b>	<b>Filter</b>	<b>Quadrant</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>		
	1	SAME	F560W	1	FASTGRPAVG8	4	1	1	7.67	59296.14		
<b>Template</b>	<b>Repeat observation</b>											
	NO											
<b>Dithers</b>	<b>#</b>										<b>Dither Type</b>	
	1										NONE	
<b>Spectral Elements</b>	<b>#</b>	<b>Coron Mask/Filter</b>	<b>Mask</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	4QPM/F1550C	4QPM	F1550C	FASTR1	5	3700	1	1	3700	5320.656	59296.1

# Proposal 1618 - Observation 5 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

<b>PSF References</b>	PSF Reference: true
<b>Special Requirements</b>	Offset 33.1634 arcsec, -5.6352 arcsec No Parallel Sequence Observations 1, 2, 3, 4, 5, 6, Non-interruptible

Proposal 1618 - Observation 2 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

Fri Aug 27 21:00:15 GMT 2021

<b>Observation</b>	<p><b>Proposal 1618, Observation 2: Alpha Cen A F1550</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: MIRI Coronagraphic Imaging</p> <p><i>Comments: Target acquisition (TA) for both alpha Cen and the PSF reference star eps Mus will be challenging due to two factors: 1) both stars are extremely bright and would saturate during the TA process; 2) the position of alpha Cen is changing by up to 10 mas per day due to its proper motion, parallax and orbital motion. We address the first point for both stars by using nearby Gaia stars as the initial target to be followed by an offset to the desired science target. Offsets are given in the sense (alpha CenRA/DEC-OffsetStarRA/DEC) after rotation into the camera coordinate system. The Gaia stars and eps Mus have highly precise Gaia positions and proper motion values. We will address the evolving position of alpha Cen A using the ALMA astrometry obtained by Akeson et al (2020) and update the offsets once the exact date of the observation. It may eventually prove necessary to treat alpha Cen as a moving target so as to mitigate its motion during the 5 hours of its observation.</i></p>																																		
	<p>(Alpha Cen A F1550 (Obs 2)) Warning (Form): Science observations should be linked to at least one other compatible science observation by an Aperture PA Offset of 1-14 degrees</p> <p>(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																																		
<b>Diagnosics</b>																																			
<b>Fixed Targets</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(4)</td> <td>ALPHACENOFFSET</td> <td>RA: 14 39 22.3404 (219.8430850d) Dec: -60 50 0.78 (-60.83355d) Equinox: J2000</td> <td>Proper Motion RA: -8.2 mas/yr Proper Motion Dec: -1.88 mas/yr Parallax: 0.0001" Epoch of Position: 2015.5</td> <td></td> </tr> </tbody> </table> <p><i>Comments: Category=Calibration Description=[Target acquisition test] Extended=NO</i></p>											#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous	(4)	ALPHACENOFFSET	RA: 14 39 22.3404 (219.8430850d) Dec: -60 50 0.78 (-60.83355d) Equinox: J2000	Proper Motion RA: -8.2 mas/yr Proper Motion Dec: -1.88 mas/yr Parallax: 0.0001" Epoch of Position: 2015.5															
	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous																														
(4)	ALPHACENOFFSET	RA: 14 39 22.3404 (219.8430850d) Dec: -60 50 0.78 (-60.83355d) Equinox: J2000	Proper Motion RA: -8.2 mas/yr Proper Motion Dec: -1.88 mas/yr Parallax: 0.0001" Epoch of Position: 2015.5																																
<b>Acquisition</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Target</th> <th>Filter</th> <th>Quadrant</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SAME</td> <td>F560W</td> <td>1</td> <td>FASTGRPAVG8</td> <td>8</td> <td>1</td> <td>1</td> <td>15.34</td> <td>59296.13</td> </tr> </tbody> </table>											#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	1	SAME	F560W	1	FASTGRPAVG8	8	1	1	15.34	59296.13				
	#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID																									
1	SAME	F560W	1	FASTGRPAVG8	8	1	1	15.34	59296.13																										
<b>Template</b>	<p><b>Repeat observation</b></p> <p>NO</p>																																		
<b>Dithers</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Dither Type</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>NONE</td> </tr> </tbody> </table>											#	Dither Type	1	NONE																				
	#	Dither Type																																	
1	NONE																																		
<b>Spectral Elements</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Coron Mask/Filter</th> <th>Mask</th> <th>Filter</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Exposures/Dith</th> <th>Total Dithers</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4QPM/F1550C</td> <td>4QPM</td> <td>F1550C</td> <td>FASTR1</td> <td>30</td> <td>1250</td> <td>1</td> <td>1</td> <td>1250</td> <td>9287.36</td> <td>59296.2</td> </tr> </tbody> </table>											#	Coron Mask/Filter	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	1	4QPM/F1550C	4QPM	F1550C	FASTR1	30	1250	1	1	1250	9287.36	59296.2
	#	Coron Mask/Filter	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID																							
1	4QPM/F1550C	4QPM	F1550C	FASTR1	30	1250	1	1	1250	9287.36	59296.2																								

# Proposal 1618 - Observation 2 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

<b>PSF References</b>	eps Mus Position A. use offset star (Obs 1) (PSF Reference; Filters [F1550C]) eps Mus position B use offset star (Obs 5) (PSF Reference; Filters [F1550C]) offset star for eps Mus. Position A. Obs 2 (Obs 4) (PSF Reference; Filters [F1550C]) offset star for eps Mus. Position B. Obs 2 (Obs 6) (PSF Reference; Filters [F1550C]) Additional Justification: false
<b>Special Requirements</b>	Aperture PA Range 98 to 100.5 Degrees (V3 93.16574676 to 95.66574676) Offset 5.5662 arcsec, -11.81901 arcsec No Parallel Sequence Observations 1, 2, 3, 4, 5, 6, Non-interruptible

Proposal 1618 - Observation 3 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

Fri Aug 27 21:00:15 GMT 2021

<b>Observation</b>	<b>Proposal 1618, Observation 3: Alpha Cen A F1550</b> <b>Diagnostic Status: Warning</b> Observing Template: MIRI Coronagraphic Imaging <i>Comments: Target acquisition (TA) for both alpha Cen and the PSF reference star eps Mus will be challenging due to two factors: 1) both stars are extremely bright and would saturate during the TA process; 2) the position of alpha Cen is changing by up to 10 mas per day due to its proper motion, parallax and orbital motion. We address the first point for both stars by using nearby Gaia stars as the initial target to be followed by an offset to the desired science target. Offsets are given in the sense (alpha CenRA/DEC-OffsetStarRA/DEC) after rotation into the camera coordinate system. The Gaia stars and eps Mus have highly precise Gaia positions and proper motion values. We will address the evolving position of alpha Cen A using the ALMA astrometry obtained by Akeson et al (2020) and update the offsets once the exact date of the observation. It may eventually prove necessary to treat alpha Cen as a moving target so as to mitigate its motion during the 5 hours of its observation.</i>																																		
	(Alpha Cen A F1550 (Obs 3)) 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 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.																																		
<b>Diagnosics</b>																																			
<b>Fixed Targets</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(4)</td> <td>ALPHACENOFFSET</td> <td>RA: 14 39 22.3404 (219.8430850d) Dec: -60 50 0.78 (-60.83355d) Equinox: J2000</td> <td>Proper Motion RA: -8.2 mas/yr Proper Motion Dec: -1.88 mas/yr Parallax: 0.0001" Epoch of Position: 2015.5</td> <td></td> </tr> </tbody> </table>											#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous	(4)	ALPHACENOFFSET	RA: 14 39 22.3404 (219.8430850d) Dec: -60 50 0.78 (-60.83355d) Equinox: J2000	Proper Motion RA: -8.2 mas/yr Proper Motion Dec: -1.88 mas/yr Parallax: 0.0001" Epoch of Position: 2015.5															
	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous																														
(4)	ALPHACENOFFSET	RA: 14 39 22.3404 (219.8430850d) Dec: -60 50 0.78 (-60.83355d) Equinox: J2000	Proper Motion RA: -8.2 mas/yr Proper Motion Dec: -1.88 mas/yr Parallax: 0.0001" Epoch of Position: 2015.5																																
<i>Comments:</i> Category=Calibration Description=[Target acquisition test] Extended=NO																																			
<b>Acquisition</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Target</th> <th>Filter</th> <th>Quadrant</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SAME</td> <td>F560W</td> <td>1</td> <td>FASTGRPAVG8</td> <td>8</td> <td>1</td> <td>1</td> <td>15.34</td> <td>59296.13</td> </tr> </tbody> </table>											#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	1	SAME	F560W	1	FASTGRPAVG8	8	1	1	15.34	59296.13				
	#	Target	Filter	Quadrant	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID																									
1	SAME	F560W	1	FASTGRPAVG8	8	1	1	15.34	59296.13																										
<b>Template</b>	Repeat observation NO																																		
<b>Dithers</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Dither Type</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>NONE</td> </tr> </tbody> </table>											#	Dither Type	1	NONE																				
	#	Dither Type																																	
1	NONE																																		
<b>Spectral Elements</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Coron Mask/Filter</th> <th>Mask</th> <th>Filter</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Exposures/Dith</th> <th>Total Dithers</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4QPM/F1550C</td> <td>4QPM</td> <td>F1550C</td> <td>FASTR1</td> <td>30</td> <td>1250</td> <td>1</td> <td>1</td> <td>1250</td> <td>9287.36</td> <td>59296.2</td> </tr> </tbody> </table>											#	Coron Mask/Filter	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	1	4QPM/F1550C	4QPM	F1550C	FASTR1	30	1250	1	1	1250	9287.36	59296.2
	#	Coron Mask/Filter	Mask	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID																							
1	4QPM/F1550C	4QPM	F1550C	FASTR1	30	1250	1	1	1250	9287.36	59296.2																								

# Proposal 1618 - Observation 3 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

<b>PSF References</b>	eps Mus Position A. use offset star (Obs 1) (PSF Reference; Filters [F1550C]) eps Mus position B use offset star (Obs 5) (PSF Reference; Filters [F1550C]) offset star for eps Mus. Position A. Obs 2 (Obs 4) (PSF Reference; Filters [F1550C]) offset star for eps Mus. Position B. Obs 2 (Obs 6) (PSF Reference; Filters [F1550C]) Additional Justification: false
<b>Special Requirements</b>	Aperture PA Range 98 to 100.5 Degrees (V3 93.16574676 to 95.66574676) Offset 5.5662 arcsec, -11.819 arcsec No Parallel Sequence Observations 1, 2, 3, 4, 5, 6, Non-interruptible

Proposal 1618 - Observation 4 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

Fri Aug 27 21:00:15 GMT 2021

<b>Observation</b>	<p><b>Proposal 1618, Observation 4: offset star for eps Mus. Position A. Obs 2</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: MIRI Coronagraphic Imaging</p> <p><i>Comments: Target acquisition (TA) for both alpha Cen and the PSF reference star eps Mus will be challenging due to two factors: 1) both stars are extremely bright and would saturate during the TA process; 2) the position of alpha Cen is changing by up to 10 mas per day due to its proper motion, parallax and orbital motion. We address the first point for both stars by using nearby Gaia stars as the initial target to be followed by an offset to the desired science target. Offsets are given in the sense (alpha CenRA/DEC-OffsetStarRA/DEC) after rotation into the camera coordinate system. The Gaia stars and eps Mus have highly precise Gaia positions and proper motion values. We will address the evolving position of alpha Cen A using the ALMA astrometry obtained by Akeson et al (2020) and update the offsets once the exact date of the observation. It may eventually prove necessary to treat alpha Cen as a moving target so as to mitigate its motion during the 5 hours of its observation.</i></p> <p><i>This TA positions eps mus behind the coronagrphic mask</i></p>											
	<p>(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>											
<b>Diagnosics</b>												
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>			<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>			
	(3)	EPS-MUS-OFFSET	RA: 12 17 34.6051 (184.3941879d) Dec: -67 57 13.07 (-67.95363d) Equinox: J2000			Proper Motion RA: -7.09 mas/yr Proper Motion Dec: 0.496 mas/yr Parallax: 0.00013" Epoch of Position: 2015.5						
<p><i>Comments:</i>                      Category=Calibration                      Description=[Target acquisition test]                      Extended=NO</p>												
<b>Acquisition</b>	<b>#</b>	<b>Target</b>	<b>Filter</b>	<b>Quadrant</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>		
	1	SAME	F560W	1	FASTGRPAVG8	4	1	1	7.67	59296.14		
<b>Template</b>	<b>Repeat observation</b>											
	NO											
<b>Dithers</b>	<b>#</b>	<b>Dither Type</b>										
	1	5-POINT-SMALL-GRID										
<b>Spectral Elements</b>	<b>#</b>	<b>Coron Mask/Filter</b>	<b>Mask</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	4QPM/F1550C	4QPM	F1550C	FASTR1	30	550	1	5	2750	20431.522	59296.4

Proposal 1618 - Observation 4 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

PSF References	PSF Reference: true
Special Requirements	Offset 25.3847 arcsec, -3.6256 arcsec No Parallel Sequence Observations 1, 2, 3, 4, 5, 6, Non-interruptible

Proposal 1618 - Observation 6 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

Fri Aug 27 21:00:15 GMT 2021

<b>Observation</b>	<p><b>Proposal 1618, Observation 6: offset star for eps Mus. Position B. Obs 2</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: MIRI Coronagraphic Imaging</p> <p><i>Comments: Target acquisition (TA) for both alpha Cen and the PSF reference star eps Mus will be challenging due to two factors: 1) both stars are extremely bright and would saturate during the TA process; 2) the position of alpha Cen is changing by up to 10 mas per day due to its proper motion, parallax and orbital motion. We address the first point for both stars by using nearby Gaia stars as the initial target to be followed by an offset to the desired science target. Offsets are given in the sense (alpha CenRA/DEC-OffsetStarRA/DEC) after rotation into the camera coordinate system. The Gaia stars and eps Mus have highly precise Gaia positions and proper motion values. We will address the evolving position of alpha Cen A using the ALMA astrometry obtained by Akeson et al (2020) and update the offsets once the exact date of the observation. It may eventually prove necessary to treat alpha Cen as a moving target so as to mitigate its motion during the 5 hours of its observation.</i></p> <p><i>This observations positions eps Mus at the future position of alpha cen which will NOT be behind the mask</i></p>											
	<p>(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>											
<b>Diagnosics</b>												
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>			<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>			
	(3)	EPS-MUS-OFFSET	RA: 12 17 34.6051 (184.3941879d) Dec: -67 57 13.07 (-67.95363d) Equinox: J2000			Proper Motion RA: -7.09 mas/yr Proper Motion Dec: 0.496 mas/yr Parallax: 0.00013" Epoch of Position: 2015.5						
<p><i>Comments:</i>                      Category=Calibration                      Description=[Target acquisition test]                      Extended=NO</p>												
<b>Acquisition</b>	<b>#</b>	<b>Target</b>	<b>Filter</b>	<b>Quadrant</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>		
	1	SAME	F560W	1	FASTGRPAVG8	4	1	1	7.67	59296.14		
<b>Template</b>	<b>Repeat observation</b>											
	NO											
<b>Dithers</b>	<b>#</b>										<b>Dither Type</b>	
	1										NONE	
<b>Spectral Elements</b>	<b>#</b>	<b>Coron Mask/Filter</b>	<b>Mask</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	4QPM/F1550C	4QPM	F1550C	FASTR1	5	3700	1	1	3700	5320.656	59296.1

# Proposal 1618 - Observation 6 - Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission

<b>PSF References</b>	PSF Reference: true
<b>Special Requirements</b>	Offset 33.1634 arcsec, -5.6352 arcsec No Parallel Sequence Observations 1, 2, 3, 4, 5, 6, Non-interruptible