



3958 - The Sickle: Pillars of Creation in the Galactic Center

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1	MIRI-POS1	MIRI Imaging	(1) SICKLE-MIRI-POS1
	2	MIRI-POS2	MIRI Imaging	(2) SICKLE-MIRI-POS2
	3	MIRI-Background	MIRI Imaging	(3) SICKLE-MIR-BACKGROUND
	7	SICKLE-NIR-mosaic	NIRCam Imaging	(5) SICKLE-NIR-POS

ABSTRACT

As H II regions expand into their natal molecular clouds, they often create bubbles whose rims contain bright ionization fronts that are often further sculpted into features similar to the beautiful and iconic "Pillars of Creation" first observed in stunning detail by HST, and recently revisited by JWST. Models confirm that these features are sites of current star formation, but questions remain as to whether the stars forming there have been triggered or are simply being revealed as their surrounding cloud is eroded away. Very high-resolution images from nearby regions have enabled these models to be rigorously tested, but for a limited range of environmental conditions. The center of the Milky Way contains some of the most extreme conditions for star formation in the Galaxy, similar to starburst galaxies but observable at spatial resolutions unachievable elsewhere. The unique combination of environmental conditions and proximity makes the Galactic Center an ideal laboratory for testing theories of star formation, which often fail in this enigmatic region. Only one Galactic Center H II region, known as the Sickle, contains structures analogous to the ionic

pillars. Until JWST, it has been impossible to observe these features with sufficient resolution to fully explore their nature as possible sites of triggered low mass star formation. We propose to obtain NIRcam and MIRI images of the Sickle pillars. When combined with recent advances in theoretical models, the proposed observations will enable us to address two essential unresolved questions of star formation in the Galactic Center: Is there triggered star formation? Is low mass star formation suppressed?

OBSERVING DESCRIPTION

We propose to observe the northern edge of the Galactic Center Sickle H II region along an ionization front that contains approximately 7 columns or pillars. We will obtain NIRcam images in F182M, F187N, F210M, F335M, F470N and F480M filters. The images will be taken with SUB640 in the RAPID mode to minimize saturation due to numerous bright stars in the field of view. We will take all of the observations using 4 groups/4 integrations/4 dithers, for a total on source time of 167 sec for each filter/position. We have selected the M filters rather than the W filters to minimize saturation from bright stars. We anticipate that approximately 10% of the stars will still experience some saturation. In this mode, we will require three pointings to cover the entire ionization front, but are also able to avoid the brightest stellar sources in the region.

We will obtain MIRI images in the F770W, F1130W and F1500W filters. To avoid background saturation and minimize saturation from stellar sources, we will be observed in the BRIGHTSKY array, in the FASTR1 readout mode. We will take all of the observations using 40 groups/1 integrations/4 dithers, for a total on source time of 138 sec for each filter/position. The selected dither pattern is point source to ensure full coverage for the primary science objects. We will require two pointings to cover the ionization front, and one to facilitate local background subtraction.

Proposal 3958 - Targets - The Sickle: Pillars of Creation in the Galactic Center

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SICKLE-MIRI-POS1	RA: 17 46 15.5600 (266.5648333d) Dec: -28 48 1.30 (-28.80036d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000	
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Emission nebulae, Stellar wind bubbles]</i> <i>Extended=YES</i>				
(2)	SICKLE-MIRI-POS2	RA: 17 46 19.9400 (266.5830833d) Dec: -28 48 8.30 (-28.80231d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000	
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Emission nebulae, H II regions]</i>				
(3)	SICKLE-MIR- BACKGROUND	RA: 17 46 8.0500 (266.5335417d) Dec: -28 41 41.70 (-28.69492d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000	
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Emission nebulae, Stellar wind bubbles]</i>				
(5)	SICKLE-NIR-POS	RA: 17 46 17.6000 (266.5733333d) Dec: -28 48 3.00 (-28.80083d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000	
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[H II regions, Molecular gas]</i>				

Fixed Targets

Proposal 3958 - Observation 1 - The Sickle: Pillars of Creation in the Galactic Center

Tue Jan 30 22:00:12 GMT 2024

Observation	<p>Proposal 3958, Observation 1: MIRI-POS1</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: MIRI Imaging</p>										
Diagnostics	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Miscellaneous			
	(1)	SICKLE-MIRI-POS1	RA: 17 46 15.5600 (266.5648333d) Dec: -28 48 1.30 (-28.80036d) Equinox: J2000			Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000					
	<p><i>Comments:</i> <i>Category=ISM</i> <i>Description=[Emission nebulae, Stellar wind bubbles]</i> <i>Extended=YES</i></p>										
Template	<p>Subarray</p> <p>BRIGHTSKY</p>										
Dithers	#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size	
	1	CYCLING	5	5		1	1			DEFAULT	
Spectral Elements	#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	F770W	FASTR1	25	1	1	Dither 1	5	5	108.16	143529
	2	F1130W	FASTR1	25	1	1	Dither 1	5	5	108.16	143529
	3	F1500W	FASTR1	25	1	1	Dither 1	5	5	108.16	143529

Proposal 3958 - Observation 2 - The Sickle: Pillars of Creation in the Galactic Center

Tue Jan 30 22:00:12 GMT 2024

Observation	<p>Proposal 3958, Observation 2: MIRI-POS2</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: MIRI Imaging</p>										
Diagnostics	(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Miscellaneous			
	(2)	SICKLE-MIRI-POS2	RA: 17 46 19.9400 (266.5830833d) Dec: -28 48 8.30 (-28.80231d) Equinox: J2000			Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000					
	<p><i>Comments:</i> <i>Category=ISM</i> <i>Description=[Emission nebulae, H II regions]</i></p>										
Template	<p>Subarray BRIGHTSKY</p>										
Dithers	#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size	
	1	CYCLING	5	5		1	1			DEFAULT	
Spectral Elements	#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	F770W	FASTR1	25	1	1	Dither 1	5	5	108.16	143529
	2	F1130W	FASTR1	25	1	1	Dither 1	5	5	108.16	143529
	3	F1500W	FASTR1	25	1	1	Dither 1	5	5	108.16	143529

Proposal 3958 - Observation 3 - The Sickie: Pillars of Creation in the Galactic Center

Tue Jan 30 22:00:12 GMT 2024

Observation	Proposal 3958, Observation 3: MIRI-Background Diagnostic Status: Warning Observing Template: MIRI Imaging										
Diagnostics	(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Miscellaneous			
	(3)	SICKLE-MIR-BACKGROUND	RA: 17 46 8.0500 (266.5335417d) Dec: -28 41 41.70 (-28.69492d) Equinox: J2000			Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000					
	<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Emission nebulae, Stellar wind bubbles]</i>										
Template	Subarray BRIGHTSKY										
Dithers	#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size	
	1	CYCLING	5	5		1	1			DEFAULT	
Spectral Elements	#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	F770W	FASTR1	25	1	1	Dither 1	5	5	108.16	143529
	2	F1130W	FASTR1	25	1	1	Dither 1	5	5	108.16	143529
	3	F1500W	FASTR1	25	1	1	Dither 1	5	5	108.16	143529

Proposal 3958 - Observation 7 - The Sickles: Pillars of Creation in the Galactic Center

Tue Jan 30 22:00:12 GMT 2024

Observation	<p>Proposal 3958, Observation 7: SICKLE-NIR-mosaic</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>									
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			
	(5)	SICKLE-NIR-POS	RA: 17 46 17.6000 (266.5733333d) Dec: -28 48 3.00 (-28.80083d) Equinox: J2000		Proper Motion RA: 0 Proper Motion Dec: 0 Epoch of Position: 2000					
	<p><i>Comments:</i> <i>Category=ISM</i> <i>Description=[H II regions, Molecular gas]</i></p>									
Template	Module		Subarray			Target Placement				
	B		SUB640			Module Gap				
Mosaic	Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order			
	3	1	10.0	6.0	0.0	0.0	DEFAULT			
Dithers	#	Primary Dither Type		Primary Dithers	Subpixel Dither Type		Dither Size	Subpixel Positions		
	1	INTRAMODULEBOX		4	SMALL-GRID-DITHER			2		
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
	1	F187N	F470N+F444W	RAPID	4	1	8	8	167.597	
	2	F182M	F480M	RAPID	4	1	8	8	167.597	
	3	F210M	F335M	RAPID	4	1	8	8	167.597	
Special Requirements	Aperture PA Range 85.02213186 to 95.02213186 Degrees (V3 85.0 to 95.0)									