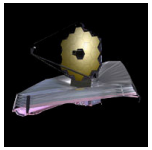

12575 - A comprehensive proper motion survey of the Milky Way Nuclear Star Cluster to reveal its formation and evolution

Cycle: 5, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
NSC_central Tight6x3				
	1	Tight6x3	NIRCam Imaging	(1) NSC_CENTRAL

ABSTRACT

We propose a new survey to measure the physical properties and kinematic structures of the Milky Way Nuclear Star Cluster (MW NSC) to constrain its formation and evolution. This survey will measure proper motions for over 300,000 stars and resulting the most comprehensive study of the MW

NSC so far. We propose to map the kinematics of the MW NSC out beyond its half-light radius (> 5pc) with NIRCam with full azimuthal coverage. The survey has the following scientific objectives: (1) Accurately measure essential physical properties such as mass and shape of the MW NSC. (2) Characterize the rotation of the MW NSC and search for kinematic substructures to test theories for its formation. (3) Investigate the interplay between the supermassive black hole, the NSC, and the larger-scale nuclear stellar disk. These measurements are necessary to constrain formation theories of how NSCs form in this extreme environment and provide us the context for comparing our Galactic nucleus with other galaxies.

OBSERVING DESCRIPTION

This proposal advocates for a proper motion survey of the Milky Way Nuclear Star Cluster (MW NSC) in order to investigate its formation and evolution. It uses a 3-pointing NIRCam mosiac (with 4 sub-pixel dithers per pointing) that will be repeated for three consecutive cycles. Each pointing/dither will use a FULLBOX 6TIGHT
dither pattern, which provides at least 8 images over ~96% of the proposed survey area in this setup. The 4 sub-pixel dithers allow us to sample the pixel phase of the point-spread function in order to maximize the astrometric performance of the dataset. We request that the observations be taken at the same position angle in each cycle in order to minimize systematic errors in the astrometry. We will use a detector setup of a BRIGHT2 readout pattern, 5 groups/Int, and 1 Int per exposure.

The survey will obtain simultaneous F212N and F480M images. Astrometry will be measured with the F212N filter, which represents an optimal balance between spatial resolution and sensitivity. Use of the narrow-band filter is necessary to reduce the impact of saturation on the measurements. Meanwhile, the combination of the F212N and F480M filters will allow us to measure stellar extinction across the proposed survey area to better than 10% precision.

Overall, these measurements will allow us to measure the proper motions for at least 300,000 stars in the MW NSC with the precision required for kinematic analysis.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NSC_CENTRAL	RA: 17 45 40.0400 (266.4168333d) Dec: -29 00 28.42 (-29.00789d) Equinox: J2000		

Comments:
Category=Stellar Cluster
Description=[Globular star clusters]

Observation

Proposal 12575, Observation 1: Tight6x3 Mon Apr 13 19:00:32 GMT 2026

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Coordinated Parallel Template(s): NIRISS Imaging

Diagnostics

(Tight6x3 (Obs 1)) Warning (Form): By selecting Target Placement = Module Gap the target coordinates will not fall on any detector unless an appropriate Mosaic, set of Dithers or Offset Special Requirement is specified.

(Visit 1:1) Warning (Form): Data Excess over lower threshold

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

(Visit 1:2) Warning (Form): Data Excess over lower threshold

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

(Visit 1:3) Warning (Form): Data Excess over lower threshold

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NSC_CENTRAL	RA: 17 45 40.0400 (266.4168333d) Dec: -29 00 28.42 (-29.00789d) Equinox: J2000		

Comments:
Category=Stellar Cluster
Description=[Globular star clusters]

Template

NIRCam Imaging	NIRISS Imaging
Module: ALL	
Subarray: FULL	
Target Placement: Module gap (large extended source)	

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
3	1	7.5	0.0	0.0	0.0	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Dither Size	Subpixel Positions	Coordinated Parallel Subpixel Selector	Dither Direct Images Primes
1	FULLBOX	6TIGHT		1	4-POINT-SMALL-WITH-NIRISS	NO_DITHERING

Spectral Elements

NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID
1	F212N	F405N+F444W	BRIGHT2	5	1	24	24	2576.825	169634.1

Spectral Elements

NIRISS Imaging	Filter	Grism	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	F140M		NISRAPID	10	1	24	24	2834.507	169634.14

Special Requirements

Between Dates 01-JUL-2027:00:00:00 and 31-DEC-2027:00:00:00
Group Visits within 53.0 Days
Aperture PA Range 86 to 90 Degrees (V3 86.07457694 to 90.07457694)
Visits Same PA
Offset 15.0 arcsec, 15.0 arcsec
No Parallel Attachments