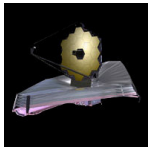

2559 - Brown Dwarfs, White Dwarfs and Planetary Disks in an Ancient Stellar System

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		NIRCam Imaging	(1) NGC-104
	51		NIRCam Imaging	(2) NGC-104-v4

ABSTRACT

Globular clusters are the oldest assemblages of stars in our Galaxy. Their roughly coeval populations, sharing the same composition and distance from Earth, are ideal laboratories to test out theories of stellar evolution. We here propose to observe the globular cluster 47 Tucanae, one of the richest and most carefully observed clusters in our Galaxy, to observe for the first time the cooling brown dwarf sequence and to hunt for ancient

planetary systems around white dwarfs. A sample of brown dwarfs that are well characterized in age, distance and metal content will help break the degeneracies that plague current brown dwarf observations and will provide an important test sample for theoretical models of these objects. Additionally, the location of the brown dwarf sequence in the JWST CMD presents a new method for estimating the age of the cluster itself. With the same observations, we will have a large sample of hot white dwarfs, between 9,500~K and 25,000~K, of which about 5\% are expected to show the presence of a debris disk if the population is similar to that of the field. On the other hand, observing the faint end of the white dwarf cooling sequence in the infrared will lead to a better understanding of atmospheric properties and systematic issues in our current models.

OBSERVING DESCRIPTION

We propose to observe the globular cluster 47 Tucane with NIRCam in imaging mode with the ultra-wide filters F150W2 and F322W2 to obtain very deep observations of faint white dwarfs, brown dwarfs and debris disks around white dwarfs.

We chose a field in the outskirts of the cluster (so that the relaxation time in the field is greater than the age of the cluster) and for which there are available deep HST observations. Our mosaic configuration will cover most of the HST deep field observed in GO-11677. Additionally, two NIRCam modules will cover fields closer to the center of the cluster, where there is also HST data (GO-12971) and two NIRCam modules will additionally cover fields at a larger distance from the center.

The search for faint brown dwarfs is what drives the exposure time. As we aim to maximize the signal to noise for faint objects, we choose a MEDIUM8 pattern with 8 groups and use a 16 subpixel dither and one integration per dither. This yields a total exposure time per field of about 3.7 hours, and S/N ratio of 15 in F322W2 and of 21 in F150W2 for a brown dwarf with magnitude in F150W2 of 28 (Vegamag).

In order to maximize the coverage of already available HST data, we provide a range of PA: between 0 and 30 degrees and between 330 and 359 degrees. In this way, 6 out of 8 modules in the mosaic will cover an existing HST field.

Proposal 2559 - Targets - Brown Dwarfs, White Dwarfs and Planetary Disks in an Ancient Stellar System

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NGC-104	RA: 00 22 38.2300 (5.6592917d) Dec: -72 04 8.54 (-72.06904d) Equinox: J2000	Proper Motion RA: 0.001137602454870418 sec of time/yr Proper Motion Dec: -0.002529999915168446 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Stellar Cluster* *Description=[Globular star clusters]*				
(2)	NGC-104-v4	RA: 00 22 20.0000 (5.5833333d) Dec: -72 03 40.00 (-72.06111d) Equinox: J2000	Proper Motion RA: 0.001137602454870418 sec of time/yr Proper Motion Dec: -0.002529999915168446 arcsec/yr Epoch of Position: 2015.5	
Comments: *Category=Stellar Cluster* *Description=[Globular star clusters]*				

Observation

Proposal 2559, Observation 1

Thu May 04 20:04:17 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

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

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

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

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NGC-104	RA: 00 22 38.2300 (5.6592917d) Dec: -72 04 8.54 (-72.06904d) Equinox: J2000	Proper Motion RA: 0.001137602454870418 sec of time/yr Proper Motion Dec: -0.002529999915168446 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Stellar Cluster
Description=[Globular star clusters]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift	Column shift	Tile Order
2	2	10.0	10.0	0.0	0.0	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		STANDARD		16

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F150W2	F322W2	MEDIUM8	8	1	16	16	13399.489	

Special Requirements	
	Group Visits within 53.0 Days Aperture PA Range 00 to 30 Degrees (V3 0.0713531 to 30.0713531) Aperture PA Range 330 to 359 Degrees (V3 330.0713531 to 359.0713531) Visits Same PA

Observation

Proposal 2559, Observation 51

Thu May 04 20:04:17 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

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

(Visit 51:1) Warning (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

(Visit 51:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 51:2) Warning (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

(Visit 51:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 51:3) Warning (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

(Visit 51:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 51:4) Warning (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	NGC-104-v4	RA: 00 22 20.0000 (5.5833333d) Dec: -72 03 40.00 (-72.06111d) Equinox: J2000	Proper Motion RA: 0.001137602454870418 sec of time/yr Proper Motion Dec: -0.002529999915168446 arcsec/yr Epoch of Position: 2015.5	

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

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift	Column shift	Tile Order
2	1	10.0	10.0	0.0	0.0	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	FULLBOX	6	STANDARD		1

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F150W2	F322W2	MEDIUM8	9	1	6	6	5669.015	

Special Requirements	
	Group Visits within 53.0 Days Aperture PA Range 180 to 240 Degrees (V3 180.0713531 to 240.0713531) Visits Same PA