



6632 - NRC-CAL-323: NIRCcam Persistence Characterization

Cycle: 3, Proposal Category: CAL/NIRCAM

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	Set pupils to FLAT	NIRCcam Dark	NONE
	2	Pre-illumination Dark modB	NIRCcam Dark	NONE
	3	Pre-illumination Dark modA	NIRCcam Dark	NONE
	4	Illumination & post-illumination darks	NIRCcam Engineering Imaging	(1) NGC-5139
	5	Photometric exposure	NIRCcam Imaging	(1) NGC-5139

ABSTRACT

This program characterizes the NIRCam persistence (latent images) and checks for changes since the Cycle 1 calibration persistence analysis. This is a continuation from Cycle 1 calibration, which is to revisit and observe a rich stellar field, Omega Cen (NGC-5139), with a long enough exposure time to probe a wide range of over-saturation levels. This is followed by a series of darks and a final short dithered sequence in a narrow-band filter to recover the source photometry.

The illumination exposure is preceded by a series of dark integrations, providing a baseline measure of the dark and noise floor to verify that no persistence from previous observations has been imprinted on the detector. The length of this preliminary dark can be shortened if scheduling can guarantee that the detector has not been exposed in the previous ~10,000 seconds. The dark has to be taken 'on site,' i.e., after the target has been acquired. This is necessary to prevent spurious exposure to bright sources during the telescope slew and target acquisition maneuver.

This calibration program may change in response to system developments and the final Cycle 3 science program.

OBSERVING DESCRIPTION

The core of Omega Cen may represent an ideal target, as it contains a multitude of stars brighter than F160W~15.7 (see Figure 1), roughly corresponding to the NIRCam saturation level in the first 10s frame. Therefore, a single “light on” exposure of this star field in BRIGHT1 mode, lasting ~430s is sufficient to saturate down to F160W~18.2, ie. almost all points sources shown in Figure 1, with the brightest ones reaching 2000 times the well depth. We expect around 2000 saturated stars per SW detector.

Following the illuminated exposure, three set of darks can be taken:

- 1) First, BRIGHT1 integrations for all detectors; this must be limited to 10 groups each and will be used to capture the initial strong decay of persistence.
- 2) Second, SHALLOW4 integrations with 10 groups. The first integration, starting after the BRIGHT1 set, captures the more typical case: a delay of a few tens of seconds corresponds to the time needed to dither the telescope.
- 3) Third, a longer exposure made of 9 MEDIUM8 integrations with 9 groups moving to longer times the persistence becomes lower. During the darks the telescope can be moved around, in the case another instrument is used as prime on the outer cluster regions.

The last observation is a dithered sequence of short RAPID integrations in a narrow band filter, e.g. F212N. Photometry of the sources is needed to pair the parameters of the decay curves to the source brightness, i.e. saturation level. F212N saturates at F160W~12.5 and F470N saturates at F160W~10 ; magnitudes for stars brighter than these values should come from ground-based observations.

Several targets would suffice for this activity. While Omega Cen is one candidate, it may not be in the field of regard at the time the observations need to be executed. 47 Tuc and/or the LMC calibration field are alternative options with the advantage of being near the continuous viewing zone.

Using a star field to characterize the persistence will not measure the persistence in individual pixels, but it will be possible to create spatial averages. Ground-based data have provided us with maps of persistence across the field. If major discrepancies are found, one may consider repeating the sequence with a different pointing to capture a larger fraction of the pixels.

There is no evidence at the moment of significant wavelength dependence of persistence; therefore, this program has been crafted for one filter pair only.

TIMING CONSTRAINTS: Observations must occur in uninterruptable sequence: Dark On Source Dark On Source.

-Obs 1: Short dark to set pupils to flat, wait 1-2 days w/ exclusive use of NRC

-Obs 2/3: FULL frame darks, each module separately, RAPID 75 groups

-Obs 4: Illumination exposure, followed by some BRIGHT1, SHALLOW4, and MEDIUM8 darks. All use both modules simultaneously, FULL frame.

-Obs 5: Short exposure in a few filters to get some accurate photometry.

Proposal 6632 - Targets - NRC-CAL-323: NIRCcam Persistence Characterization

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	NGC-5139	RA: 13 26 47.2800 (201.6970000d) Dec: -47 28 46.10 (-47.47947d) Equinox: J2000	Proper Motion RA: -3.24 mas/yr Proper Motion Dec: -6.729999904564465 mas/yr Parallax: 1.93E-4" Epoch of Position: 2000	
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> <i>Category=Stellar Cluster</i> <i>Description=[Globular star clusters]</i>					

Proposal 6632 - Observation 1 - NRC-CAL-323: NIRCcam Persistence Characterization

Tue Jun 04 21:01:25 GMT 2024

Observation	<p>Proposal 6632, Observation 1: Set pupils to FLAT</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Dark</p>							
Diagnostics	<p>(Set pupils to FLAT (Obs 1)) Warning (Form): PARALLEL requirement expected.</p> <p>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>							
Template	Module	Subarray	Science Template	Coronagraphic Mask	No. of Output Channels			
	ALL	FULL	Imaging		4			
Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	RAPID	2	1	1	1	21.474	
Special Requirements	<p>2 After 1 by 1 Days to 2 Days, Exclusive Use Of Instrument</p>							

Proposal 6632 - Observation 2 - NRC-CAL-323: NIRCcam Persistence Characterization

Tue Jun 04 21:01:25 GMT 2024

Observation	<p>Proposal 6632, Observation 2: Pre-illumination Dark modB</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Dark</p>							
Diagnostics	<p>(Pre-illumination Dark modB (Obs 2)) Warning (Form): PARALLEL requirement expected.</p> <p>(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>							
Template	Module	Subarray	Science Template	Coronagraphic Mask	No. of Output Channels			
	B	FULL	Imaging		4			
Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	RAPID	75	1	1	1	805.258	
Special Requirements	<p>2 After 1 by 1 Days to 2 Days, Exclusive Use Of Instrument</p> <p>Sequence Observations 2, 3, 4, 5, Non-interruptible, Exclusive Use Of Instrument</p>							

Proposal 6632 - Observation 3 - NRC-CAL-323: NIRCcam Persistence Characterization

Tue Jun 04 21:01:25 GMT 2024

Observation	<p>Proposal 6632, Observation 3: Pre-illumination Dark modA</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Dark</p>							
Diagnostics	<p>(Pre-illumination Dark modA (Obs 3)) Warning (Form): PARALLEL requirement expected.</p> <p>(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>							
Template	Module	Subarray	Science Template	Coronagraphic Mask	No. of Output Channels			
	A	FULL	Imaging		4			
Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	RAPID	75	1	1	1	805.258	
Special Requirements	<p>Sequence Observations 2, 3, 4, 5, Non-interruptible, Exclusive Use Of Instrument</p>							

Proposal 6632 - Observation 4 - NRC-CAL-323: NIRCam Persistence Characterization

Tue Jun 04 21:01:25 GMT 2024

Observation	<p>Proposal 6632, Observation 4: Illumination & post-illumination darks</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Engineering Imaging</p>											
Diagnostics	<p>(Visit 4:1) Warning (Form): Data Excess over middle threshold</p> <p>(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(1)	NGC-5139	RA: 13 26 47.2800 (201.6970000d) Dec: -47 28 46.10 (-47.47947d) Equinox: J2000			Proper Motion RA: -3.24 mas/yr Proper Motion Dec: -6.729999904564465 mas/yr Parallax: 1.93E-4" Epoch of Position: 2000						
	<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>Category=Stellar Cluster</i></p> <p><i>Description=[Globular star clusters]</i></p>											
Template	Module					Subarray						
	ALL					FULL						
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions		
	1	NONE				STANDARD				1		
Spectral Elements	#	Short Pupil	Long Pupil	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
	1	CLEAR	CLEAR	F115W	F277W	BRIGHT1	20	1	1	1	418.734	
	2	FLAT	FLAT	F115W	F277W	BRIGHT1	10	10	10	1	2136.617	
	3	FLAT	FLAT	F115W	F277W	BRIGHT1	10	10	10	1	2136.617	
	4	FLAT	FLAT	F115W	F277W	SHALLOW4	10	10	10	1	5357.648	
	5	FLAT	FLAT	F115W	F277W	SHALLOW4	10	10	10	1	5357.648	
	6	FLAT	FLAT	F115W	F277W	MEDIUM8	10	9	9	1	9555.725	
Special Requirements	Sequence Observations 2, 3, 4, 5, Non-interruptible, Exclusive Use Of Instrument											

Proposal 6632 - Observation 5 - NRC-CAL-323: NIRCam Persistence Characterization

Tue Jun 04 21:01:25 GMT 2024

Observation	<p>Proposal 6632, Observation 5: Photometric exposure</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>									
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		
	(1)	NGC-5139	RA: 13 26 47.2800 (201.6970000d) Dec: -47 28 46.10 (-47.47947d) Equinox: J2000		Proper Motion RA: -3.24 mas/yr Proper Motion Dec: -6.729999904564465 mas/yr Parallax: 1.93E-4" Epoch of Position: 2000					
	<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>Category=Stellar Cluster</i></p> <p><i>Description=[Globular star clusters]</i></p>									
Template	Module		Subarray			Target Placement				
	ALL		FULL			Module Gap				
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size	Subpixel Positions	
	1	NONE				STANDARD			5	
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
	1	F212N	F470N+F444W	RAPID	2	2	10	5	268.419	
Special Requirements	Sequence Observations 2, 3, 4, 5, Non-interruptible, Exclusive Use Of Instrument									