



1478 - NIRCcam Persistence Characterization

Cycle: 1, 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>
Updated 29June2022				
	8	Set pupils to FLAT	NIRCcam Dark	NONE
	12	Pre-illumination Dark modB	NIRCcam Dark	NONE
	13	Pre-illumination Dark modA	NIRCcam Dark	NONE
	14	Illumination & post-illumination darks	NIRCcam Engineering Imaging	(3) NGC-5139
	15	Photometric exposure	NIRCcam Imaging	(3) NGC-5139

ABSTRACT

This program characterizes the NIRCcam persistence (latent images) and checks for changes since the commissioning persistence check. The plan is to observe a rich stellar field, e. g. Omega Cen or 47 Tuc, with a long enough exposure time to probe a wide range of over-saturation levels, 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 and 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 ~10,000s. The dark has to be taken “on site”, i.e. after the target has been acquired. This is needed to prevent spurious exposure to bright sources during the telescope slew and target acquisition maneuver.

This calibration program is provisional and may change in response to system developments and the final science program.

OBSERVING DESCRIPTION

June 29, 2022 MBoyer

Edited program based on Commissioning information. New program:

- Obs 8: Short dark to set pupils to flat, wait 1-2 days w/ exclusive use of NRC
- Obs 12/13: FULL frame darks, each module separately, RAPID 75 groups
- Obs 14: Illumination exposure, followed by some RAPID darks, followed by some BRIGHT1 darks. All use both modules simultaneously, FULL frame.
- Obs 15: Short exposure in a few filters to get some accurate photometry.

Note obs 4-7 did not execute b/c they were removed from OP before execution. (We've since removed those obs from the APT file)

Nov 2019 MBoyer

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 NIRCcam 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 point sources shown in Figure 1 (see activity summary), 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, 3 RAPID integrations for all detectors; this must be limited to 2 groups each (~20s) and will be used to capture the initial strong decay of persistence.
- 2) Second, SHALLOW2 integration with 10 groups (about 9 minutes). The first integration, starting about 60s after the RAPID set, captures the

more typical case: a delay of a few tens of seconds corresponds to the time needed to dither the telescope. We prefer the SHALLOW2 pattern instead of the SHALLOW4 pattern, that would delivers lower readout noise, because averaging their values over ~40s by grouping 4 frames may affect the estimate of the parameters.

3) Third, a longer exposure made of 10 SHALLOW4 integration with 10 groups (about 90 min total); moving to longer times the persistence becomes lower and is preferable to coadd 4 frames to beat down the readout noise. Also, once the slope has flattened out the effect of frame averaging becomes marginal.

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 be sufficient for this activity. Omega Cen is one candidate, but 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 to, 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 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.

Proposal 1478 - Targets - NIRCcam Persistence Characterization

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(3)	NGC-5139	RA: 13 26 47.2800 (201.6970000d) Dec: -47 28 46.10 (-47.47947d) Equinox: J2000		
<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 1478 - Observation 8 - NIRCcam Persistence Characterization

Wed Jul 27 23:00:10 GMT 2022

Observation	<p>Proposal 1478, Observation 8: Set pupils to FLAT</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Dark</p>							
	<p>(Set pupils to FLAT (Obs 8)) Warning (Form): PARALLEL requirement expected.</p> <p>(Visit 8:1) 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	

Proposal 1478 - Observation 12 - NIRCcam Persistence Characterization

Wed Jul 27 23:00:10 GMT 2022

Observation	<p>Proposal 1478, Observation 12: Pre-illumination Dark modB</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Dark</p>							
Diagnostics	<p>(Pre-illumination Dark modB (Obs 12)) Warning (Form): PARALLEL requirement expected.</p> <p>(Visit 12:1) 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>Sequence Observations 12, 13, 14, 15, Non-interruptible, Exclusive Use Of Instrument</p>							

Proposal 1478 - Observation 13 - NIRCcam Persistence Characterization

Wed Jul 27 23:00:10 GMT 2022

Observation	<p>Proposal 1478, Observation 13: Pre-illumination Dark modA</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Dark</p>																						
Diagnostics	<p>(Pre-illumination Dark modA (Obs 13)) Warning (Form): PARALLEL requirement expected.</p> <p>(Visit 13:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																						
Template	<table border="1"> <thead> <tr> <th>Module</th> <th>Subarray</th> <th>Science Template</th> <th>Coronagraphic Mask</th> <th>No. of Output Channels</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>FULL</td> <td>Imaging</td> <td></td> <td>4</td> </tr> </tbody> </table>	Module	Subarray	Science Template	Coronagraphic Mask	No. of Output Channels	A	FULL	Imaging		4												
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1	RAPID	75	1	1	1	805.258																	
Special Requirements	<p>Sequence Observations 12, 13, 14, 15, Non-interruptible, Exclusive Use Of Instrument</p>																						

Proposal 1478 - Observation 14 - NIRCcam Persistence Characterization

Wed Jul 27 23:00:10 GMT 2022

Observation	Proposal 1478, Observation 14: Illumination & post-illumination darks Diagnostic Status: Warning Observing Template: NIRCcam Engineering Imaging											
	(Visit 14:1) Warning (Form): Data Excess over middle threshold (Visit 14:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(3)	NGC-5139	RA: 13 26 47.2800 (201.6970000d) Dec: -47 28 46.10 (-47.47947d) Equinox: J2000									
<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>												
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	RAPID	4	1	1	1	42.947	
	3	FLAT	FLAT	F115W	F277W	RAPID	4	1	1	1	42.947	
	4	FLAT	FLAT	F115W	F277W	RAPID	4	1	1	1	42.947	
	5	FLAT	FLAT	F115W	F277W	BRIGHT1	10	3	3	1	633.469	
	6	FLAT	FLAT	F115W	F277W	BRIGHT1	10	10	10	1	2136.617	
	7	FLAT	FLAT	F115W	F277W	BRIGHT1	10	10	10	1	2136.617	
	8	FLAT	FLAT	F115W	F277W	BRIGHT1	10	10	10	1	2136.617	
Special Requirements	Sequence Observations 12, 13, 14, 15, Non-interruptible, Exclusive Use Of Instrument											

Proposal 1478 - Observation 15 - NIRCam Persistence Characterization

Wed Jul 27 23:00:10 GMT 2022

Observation	<p>Proposal 1478, Observation 15: Photometric exposure Diagnostic Status: Warning Observing Template: NIRCam Imaging</p>									
Diagnostics	(Visit 15:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections			Miscellaneous		
	(3)	NGC-5139	RA: 13 26 47.2800 (201.6970000d) Dec: -47 28 46.10 (-47.47947d) Equinox: J2000							
	<p><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></p>									
Template	Module				Subarray					
	ALL				FULL					
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 12, 13, 14, 15, Non-interruptible, Exclusive Use Of Instrument									