



1477 - NIRCам Total-count and Count-rate Linearity 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>
Observation Folder				
	1	Module A FULL	NIRCам Engineering Imaging	(2) LMC-CALIBRATION-FIELD
	2	Module B FULL	NIRCам Engineering Imaging	(2) LMC-CALIBRATION-FIELD
	3	Module A SUB160	NIRCам Engineering Imaging	(3) 2MASS-J05220360-6930068
	4	Module B SUB160	NIRCам Engineering Imaging	(3) 2MASS-J05220360-6930068
	5	Module A SUB64P	NIRCам Engineering Imaging	(3) 2MASS-J05220360-6930068
	6	Module B SUB64P	NIRCам Engineering Imaging	(3) 2MASS-J05220360-6930068

ABSTRACT

The purpose of this activity is to verify that the linearity behavior has not changed. The program requires observations of a rich stellar field that is bright and dense down to the confusion limit. To spread the flux more evenly, we may use a weak lens to introduce defocusing. The goal is to probe the linearity of a large sample of pixels across the detector. This program will likely target the LMC calibration field, which is in the CVZ. Alternatively, we could target Omega Cen, which was used for the WFC3 linearity study.

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

OBSERVING DESCRIPTION

Nov 2019 MBoyer

The data will be taken in RAPID readout mode, saving every frame. The number of groups should be adjusted to allow the majority of pixels to reach hard saturation by the end of the ramp. A large number (>150) of groups is needed to finely sample the nonlinearity over a wide range of flux levels and unveil possible differences with ground-based data. Since we are operating only one module at a time, this should not cause data-ingest issues. The exposures can be executed with a broad (R~4) and a narrow-band filter (R~80) to further expand the range of flux levels probed. We will perform dithers (2 large INTRASCA, or 24'') since several pixels will be impacted by CRs in each exposures. This set of observations will allow us to assess how detector linearity varies with flux (electrons/s) and fluence (total electrons).

Using ETC v1.1.1, we compute that with 150 groups in RAPID readout, at least 200(900) stars in the LMC calibration field will saturate in a SW(LW) detector using the F150W(F277W) filter (stars with $K < 18.6$ mag). With 200 groups in RAPID readout, we find at least 30(140) saturated stars in each SW(LW) detectors with the F164N(F332N) filter. By dithering, we will correct for CRs and increase the number of saturated pixels.

Subarrays are also included to check the impact of subarray timing and detector glow on linearity. SUB160 and SUB64P will be included -- glow is strongest in the smallest subarrays. Only 1 wide filter pair will be used (F150W/F277W). The target is a bright ($K_{\text{mag}}=13$) star near the center of the LMC field (2MASS J05220360-6930068) if the LMC field is used for the FULL frame observations. With 5000 groups in SUB64P, this star will saturate > 20 pixels by the end of the ramp. Four SUBARRAY_DITHERS will put the star at 4 locations across the subarray to increase the number of saturated pixels. With 1000 groups in SUB160, stars as faint as $K_{\text{mag}}=16$ will saturate. A 4-pt INTRAMODULEBOX dither places the 2MASS star on each SW detector, and each SW detector should also capture at least one additional saturated star (THIS NEEDS TO BE VERIFIED).

--- July 2019 MBoyer

Including SUB160 and SUB64P on both modules to assess the effect of detector glow. Only doing 1 filter pair for these (wide filters). Centering both on a bright ($K_{\text{mag}}=13$) star near the center of the LMC calibration field. Dithering so that every detector/subarray touches the bright star. SUB160 with 1000 groups will saturate as faint as $K_{\text{mag}}=16$. A quick check indicates that at this location, each SW detector will saturate at least one additional star. This needs to be verified.

--- April 2018 MBoyer

Observing LMC calibration field

2 filters in each (SW/LW) channel: one wide and one narrow

Dithers to correct for cosmic rays

Observe each module separately to limit data volume

Proposal 1477 - Targets - NIRCcam Total-count and Count-rate Linearity Characterization

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(2)	LMC-CALIBRATION-FIELD	RA: 05 21 57.1928 (80.4883033d) Dec: -69 29 55.32 (-69.49870d) Equinox: J2000		
<i>Comments: Category=Calibration</i> <i>Description=[Astrometric, Detector linearity test, Line spread function, Photometric, Point spread function]</i>					
(3)	2MASS-J05220360-6930068	RA: 05 22 3.6090 (80.5150375d) Dec: -69 30 6.84 (-69.50190d) Equinox: J2000	Epoch of Position: 2015.5		
<i>Comments: This is a Kmag=13 star near the center of the LMC cal field.</i> <i>Category=Calibration</i> <i>Description=[Detector linearity test]</i>					

Proposal 1477 - Observation 1 - NIRCcam Total-count and Count-rate Linearity Characterization

Wed Jun 24 06:00:18 GMT 2020

Observation	Proposal 1477, Observation 1: Module A FULL Diagnostic Status: Warning Observing Template: NIRCcam Engineering Imaging											
	(Visit 1:1) Warning (Form): Data volume for this visit 30128.36 MB exceeds half the maximum allowed of 58000.0 MB. (Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Diagnosics												
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(2)	LMC-CALIBRATION-FIELD	RA: 05 21 57.1928 (80.4883033d) Dec: -69 29 55.32 (-69.49870d) Equinox: J2000									
Comments: Category=Calibration Description=[Astrometric, Detector linearity test, Line spread function, Photometric, Point spread function]												
Template	Module					Subarray						
	A					FULL						
Dithers	#	Primary Dither Type		WFSC Primary Dithers	Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions	
	1	INTRASCA			2		STANDARD		24" (LARGE)		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	F323N	F187N	F322W2	RAPID	200	1	2	2	4294.708	
	2	CLEAR	CLEAR	F150W	F277W	RAPID	150	1	2	2	3221.031	

Proposal 1477 - Observation 2 - NIRCcam Total-count and Count-rate Linearity Characterization

Wed Jun 24 06:00:18 GMT 2020

Observation	<p>Proposal 1477, Observation 2: Module B FULL</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Engineering Imaging</p>											
Diagnostics	<p>(Visit 2:1) Warning (Form): Data volume for this visit 30128.36 MB exceeds half the maximum allowed of 58000.0 MB.</p> <p>(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(2)	LMC-CALIBRATION-FIELD	RA: 05 21 57.1928 (80.4883033d)									
			Dec: -69 29 55.32 (-69.49870d)									
			Equinox: J2000									
	<p><i>Comments:</i></p> <p><i>Category=Calibration</i></p> <p><i>Description=[Astrometric, Detector linearity test, Line spread function, Photometric, Point spread function]</i></p>											
Template	Module					Subarray						
	B					FULL						
Dithers	#	Primary Dither Type		WFSC Primary Dithers	Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions	
	1	INTRASCA			2		STANDARD		24" (LARGE)		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	F323N	F187N	F322W2	RAPID	200	1	2	2	4294.708	
	2	CLEAR	CLEAR	F150W	F277W	RAPID	150	1	2	2	3221.031	

Proposal 1477 - Observation 3 - NIRCcam Total-count and Count-rate Linearity Characterization

Wed Jun 24 06:00:18 GMT 2020

Observation	Proposal 1477, Observation 3: Module A SUB160 Diagnostic Status: Warning Observing Template: NIRCcam Engineering Imaging											
	(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)	2MASS-J05220360-6930068	RA: 05 22 3.6090 (80.5150375d) Dec: -69 30 6.84 (-69.50190d) Equinox: J2000			Epoch of Position: 2015.5						
<i>Comments: This is a Kmag=13 star near the center of the LMC cal field.</i> <i>Category=Calibration</i> <i>Description=[Detector linearity test]</i>												
Template	Module					Subarray						
	A					SUB160						
Dithers	#	Primary Dither Type		WFSC Primary Dithers	Primary Dithers		Subpixel Dither Type		Dither Size	Subpixel Positions		
	1	INTRAMODULEBOX			4		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	F150W	F277W	RAPID	1000	1	4	4	1115.695	

Proposal 1477 - Observation 4 - NIRCcam Total-count and Count-rate Linearity Characterization

Wed Jun 24 06:00:18 GMT 2020

Observation	Proposal 1477, Observation 4: Module B SUB160 Diagnostic Status: Warning Observing Template: NIRCcam Engineering Imaging											
	(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(3)	2MASS-J05220360-6930068	RA: 05 22 3.6090 (80.5150375d) Dec: -69 30 6.84 (-69.50190d) Equinox: J2000			Epoch of Position: 2015.5						
<i>Comments: This is a Kmag=13 star near the center of the LMC cal field.</i> <i>Category=Calibration</i> <i>Description=[Detector linearity test]</i>												
Template	Module					Subarray						
	B					SUB160						
Dithers	#	Primary Dither Type		WFSC Primary Dithers	Primary Dithers		Subpixel Dither Type		Dither Size	Subpixel Positions		
	1	INTRAMODULEBOX			4		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	F150W	F277W	RAPID	1000	1	4	4	1115.695	

Proposal 1477 - Observation 5 - NIRCcam Total-count and Count-rate Linearity Characterization

Wed Jun 24 06:00:18 GMT 2020

Observation	<p>Proposal 1477, Observation 5: Module A SUB64P</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Engineering 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			
	(3)	2MASS-J05220360-6930068	RA: 05 22 3.6090 (80.5150375d) Dec: -69 30 6.84 (-69.50190d) Equinox: J2000			Epoch of Position: 2015.5						
	<p><i>Comments: This is a Kmag=13 star near the center of the LMC cal field.</i></p> <p><i>Category=Calibration</i></p> <p><i>Description=[Detector linearity test]</i></p>											
Template	Module					Subarray						
	A					SUB64P						
Dithers	#	Primary Dither Type		WFSC Primary Dithers	Primary Dithers		Subpixel Dither Type		Dither Size	Subpixel Positions		
	1	SUBARRAY_DITHER			4		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	F150W	F277W	RAPID	5000	1	4	4	1003.411	

Proposal 1477 - Observation 6 - NIRCcam Total-count and Count-rate Linearity Characterization

Wed Jun 24 06:00:18 GMT 2020

Observation	<p>Proposal 1477, Observation 6: Module B SUB64P</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCcam Engineering Imaging</p>											
Diagnostics	(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections			Miscellaneous				
	(3)	2MASS-J05220360-6930068	RA: 05 22 3.6090 (80.5150375d) Dec: -69 30 6.84 (-69.50190d) Equinox: J2000		Epoch of Position: 2015.5							
	<p><i>Comments: This is a Kmag=13 star near the center of the LMC cal field.</i></p> <p><i>Category=Calibration</i></p> <p><i>Description= Detector linearity test </i></p>											
Template	Module					Subarray						
	B					SUB64P						
Dithers	#	Primary Dither Type		WFSC Primary Dithers	Primary Dithers	Subpixel Dither Type		Dither Size	Subpixel Positions			
	1	SUBARRAY_DITHER			4	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	F150W	F277W	RAPID	5000	1	4	4	1003.411	