



# 1453 - NIRCcam Dark Current and Read-Noise Monitor

Cycle: 1, Proposal Category: CAL/NIRCAM

## INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
<b>Dr. Martha L. Boyer (PI)</b>	<b>Space Telescope Science Institute</b>	<b>mboyer@stsci.edu</b>

## OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
initial: Rapid 150, 2 ints				
	11	A	NIRCcam Dark	NONE
	12	B	NIRCcam Dark	NONE
monitor: Rapid 150, 2 ints				
	15	A	NIRCcam Dark	NONE
	16	B	NIRCcam Dark	NONE
monitor: Rapid 150, 2 ints				
	17	A	NIRCcam Dark	NONE
	18	B	NIRCcam Dark	NONE
monitor: Rapid 150, 2 ints				
	19	A	NIRCcam Dark	NONE
	20	B	NIRCcam Dark	NONE
monitor: Rapid 150, 2 ints				
	21	A	NIRCcam Dark	NONE
	22	B	NIRCcam Dark	NONE

## ABSTRACT

This program monitors the FULL frame noise properties by taking dark observations throughout Cycle 1 using the equivalent of every readout pattern. The Darks are set up to characterize the dark current, 1/f noise, IPC, cross-talk, and superbias. We note that the dark current itself is so low

(1.9/27 e-/ks for the shortwave/longwave channel) that achieving a good S/N per pixel is prohibitive for the shortwave channel. However, hot pixels are still characterized, and the overall temporal evolution of the dark current can be monitored with the median of the full frame. For this activity, the pupil wheels will be set to the “Dark” position. Subarray darks are obtained in NIRCcam-016.

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

## **OBSERVING DESCRIPTION**

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Nov 2019 MBoyer

APT allows ramps as long as 4152s, but this program restricts the Darks to 150 frames/ramp (1605s) since we generally recommend keeping ramps  $\sim$ <1500s. This will be revisited later if approved science programs in Cycle 1 require longer ramps. The RAPID pattern with 108 groups (to be consistent with CV3) can be used to reconstruct the BRIGHT1, BRIGHT2, SHALLOW2, SHALLOW4, MEDIUM2, and MEDIUM8 readout patterns since they all require <100 frames. To reconstruct the DEEP patterns, we have two options: (1) use RAPID with NGROUP=150 (to achieve DEEP2/8 with NGROUP=8, or 1520s/1583s), or (2) use DEEP2/8 with NGROUP=8 in addition to the RAPID-108 observations. The first option uses less time, the second option uses less data volume. This program is designed following the first option because, at the time of writing, the JWST pipeline requires dark reference files to be in RAPID.

The large data volume in RAPID mode requires the modules (5 detectors each) to be observed separately. The DEEP patterns (if used) can be observed using both modules simultaneously.

To construct a superbias, we require multiple integrations that we will build up over Cycle 1, while also monitoring read noise. We will aim for 10 ramps in each module to enable a decrease in the noise by a factor of  $\sim$ 3. To achieve this, we'll include 5 sets throughout Cycle 1, each with 2 integrations.

**TIMING CONSTRAINTS:** Darks should be repeated in order to see how the noise properties depend on telescope temperature, attitude, downlink activity, cross-talk during parallels, etc. The read noise was stable over 4 months between CV2 and CV3, so we require monitoring on a 4 month timescale to check stability. We are obtaining Darks in 5 epochs total to avoid issues with data volume – one epoch should be taken roughly during months 1, 4, 8, and 12. The fifth epoch can be taken at any time.

NOTE: The dates for observations 11 and 12 (epoch 1) will need updating to reflect the end of Commissioning. These are set in the Special Requirements

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Sep 2020 submission by MBoyer includes timing constraints that assume an Oct 31, 2021 launch.

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Jan 2022 submission by MBoyer includes timing constraints for the Dec 25, 2021 launch

Proposal 1453 - Observation 11 - NIRCcam Dark Current and Read-Noise Monitor

Thu Nov 10 00:00:26 GMT 2022

<b>Observation</b>	<p><b>Proposal 1453, Observation 11: A</b>  <b>Diagnostic Status: Warning</b>                  Observing Template: NIRCcam Dark</p>							
<b>Diagnostics</b>	<p>(Visit 11:1) Warning (Form): Data Excess over lower threshold                  (Visit 11:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>							
<b>Template</b>	<b>Module</b>	<b>Subarray</b>	<b>Science Template</b>	<b>Coronagraphic Mask</b>	<b>No. of Output Channels</b>			
	A	FULL	Imaging		4			
<b>Spectral Elements</b>	<b>#</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	RAPID	150	2	1	2	3231.768	
<b>Special Requirements</b>	<p>Between Dates 01-MAY-2022:00:00:00 and 01-AUG-2022:00:00:00                  Parallel</p>							

Proposal 1453 - Observation 12 - NIRCam Dark Current and Read-Noise Monitor

Thu Nov 10 00:00:26 GMT 2022

<b>Observation</b>	<p><b>Proposal 1453, Observation 12: B</b>  <b>Diagnostic Status: Warning</b>                  Observing Template: NIRCam Dark</p>							
<b>Diagnostics</b>	<p>(Visit 12:1) Warning (Form): Data Excess over lower threshold                  (Visit 12:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>							
<b>Template</b>	<b>Module</b>	<b>Subarray</b>	<b>Science Template</b>	<b>Coronagraphic Mask</b>	<b>No. of Output Channels</b>			
	B	FULL	Imaging		4			
<b>Spectral Elements</b>	<b>#</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	RAPID	150	2	1	2	3231.768	
<b>Special Requirements</b>	Parallel							

Proposal 1453 - Observation 15 - NIRCcam Dark Current and Read-Noise Monitor

Thu Nov 10 00:00:26 GMT 2022

<b>Observation</b>	<p><b>Proposal 1453, Observation 15: A</b>  <b>Diagnostic Status: Warning</b>                  Observing Template: NIRCcam Dark</p>							
<b>Diagnostics</b>	<p>(Visit 15:1) Warning (Form): Data Excess over lower threshold                  (Visit 15:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>							
<b>Template</b>	<b>Module</b>	<b>Subarray</b>	<b>Science Template</b>	<b>Coronagraphic Mask</b>	<b>No. of Output Channels</b>			
	A	FULL	Imaging		4			
<b>Spectral Elements</b>	<b>#</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	RAPID	150	2	1	2	3231.768	
<b>Special Requirements</b>	<p>Between Dates 2022.302:05:21:41 and 2022.332:05:21:41                  Parallel                  17 After 15 by 120 Days to 150 Days</p>							

Proposal 1453 - Observation 16 - NIRCcam Dark Current and Read-Noise Monitor

Thu Nov 10 00:00:26 GMT 2022

<b>Observation</b>	<p><b>Proposal 1453, Observation 16: B</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRCcam Dark</p>																							
<b>Diagnostics</b>	<p>(Visit 16:1) Warning (Form): Data Excess over lower threshold</p> <p>(Visit 16:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																							
<b>Template</b>	<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>B</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	B	FULL	Imaging		4													
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B	FULL	Imaging		4																				
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1	RAPID	150	2	1	2	3231.768																		
<b>Special Requirements</b>	<p>Between Dates 2023.008:16:05:18 and 2023.038:16:05:18</p> <p>Parallel</p> <p>18 After 16 by 120 Days to 150 Days</p>																							

Proposal 1453 - Observation 17 - NIRCcam Dark Current and Read-Noise Monitor

Thu Nov 10 00:00:26 GMT 2022

<b>Observation</b>	<p><b>Proposal 1453, Observation 17: A</b>  <b>Diagnostic Status: Warning</b>                  Observing Template: NIRCcam Dark</p>																							
<b>Diagnostics</b>	<p>(Visit 17:1) Warning (Form): Data Excess over lower threshold                  (Visit 17:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																							
<b>Template</b>	<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	150	2	1	2	3231.768																		
<b>Special Requirements</b>	<p>Parallel                  17 After 15 by 120 Days to 150 Days                  19 After 17 by 120 Days to 150 Days</p>																							

Proposal 1453 - Observation 18 - NIRCcam Dark Current and Read-Noise Monitor

Thu Nov 10 00:00:26 GMT 2022

<b>Observation</b>	<p><b>Proposal 1453, Observation 18: B</b>  <b>Diagnostic Status: Warning</b>                  Observing Template: NIRCcam Dark</p>																							
<b>Diagnostics</b>	<p>(Visit 18:1) Warning (Form): Data Excess over lower threshold                  (Visit 18:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																							
<b>Template</b>	<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>B</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	B	FULL	Imaging		4													
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1	RAPID	150	2	1	2	3231.768																		
<b>Special Requirements</b>	<p>Parallel                  18 After 16 by 120 Days to 150 Days                  20 After 18 by 120 Days to 150 Days</p>																							

Proposal 1453 - Observation 19 - NIRCcam Dark Current and Read-Noise Monitor

Thu Nov 10 00:00:26 GMT 2022

<b>Observation</b>	<p><b>Proposal 1453, Observation 19: A</b>  <b>Diagnostic Status: Warning</b>                  Observing Template: NIRCcam Dark</p>							
<b>Diagnostics</b>	<p>(Visit 19:1) Warning (Form): Data Excess over lower threshold                  (Visit 19:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>							
<b>Template</b>	<b>Module</b>	<b>Subarray</b>	<b>Science Template</b>	<b>Coronagraphic Mask</b>	<b>No. of Output Channels</b>			
	A	FULL	Imaging		4			
<b>Spectral Elements</b>	<b>#</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	RAPID	150	2	1	2	3231.768	
<b>Special Requirements</b>	<p>Parallel                  19 After 17 by 120 Days to 150 Days</p>							

Proposal 1453 - Observation 20 - NIRCcam Dark Current and Read-Noise Monitor

Thu Nov 10 00:00:26 GMT 2022

<b>Observation</b>	<p><b>Proposal 1453, Observation 20: B</b>  <b>Diagnostic Status: Warning</b>                  Observing Template: NIRCcam Dark</p>																							
<b>Diagnostics</b>	<p>(Visit 20:1) Warning (Form): Data Excess over lower threshold                  (Visit 20:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																							
<b>Template</b>	<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>B</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	B	FULL	Imaging		4													
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1	RAPID	150	2	1	2	3231.768																		
<b>Special Requirements</b>	<p>Parallel                  20 After 18 by 120 Days to 150 Days</p>																							

Proposal 1453 - Observation 21 - NIRCam Dark Current and Read-Noise Monitor

Thu Nov 10 00:00:26 GMT 2022

<b>Observation</b>	<p><b>Proposal 1453, Observation 21: A</b>  <b>Diagnostic Status: Warning</b>                  Observing Template: NIRCam Dark</p>																							
<b>Diagnostics</b>	<p>(Visit 21:1) Warning (Form): Data Excess over lower threshold                  (Visit 21:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																							
<b>Template</b>	<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	150	2	1	2	3231.768																		
<b>Special Requirements</b>	<p>Parallel</p>																							

Proposal 1453 - Observation 22 - NIRCcam Dark Current and Read-Noise Monitor

Thu Nov 10 00:00:26 GMT 2022

<b>Observation</b>	<p><b>Proposal 1453, Observation 22: B</b>  <b>Diagnostic Status: Warning</b>                  Observing Template: NIRCcam Dark</p>							
<b>Diagnostics</b>	<p>(Visit 22:1) Warning (Form): Data Excess over lower threshold                  (Visit 22:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>							
<b>Template</b>	<b>Module</b>	<b>Subarray</b>	<b>Science Template</b>	<b>Coronagraphic Mask</b>	<b>No. of Output Channels</b>			
	B	FULL	Imaging		4			
<b>Spectral Elements</b>	<b>#</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	RAPID	150	2	1	2	3231.768	
<b>Special Requirements</b>	Parallel							