



## 1260 - NGC 1068 As Proving Ground for NIRISS AMI

Cycle: 1, Proposal Category: GTO

### INVESTIGATORS

<i>Name</i>	<i>Institution</i>
<b>Prof. K. E. Saavik Ford (PI)</b>	<b>City University of New York Borough of Manhattan Comm Coll</b>
Prof. Barry Mckernan (CoI)	City University of New York Borough of Manhattan Comm Coll
Dr. Anand Sivaramakrishnan (CoI)	Space Telescope Science Institute
Dr. Andre Martel (CoI)	Space Telescope Science Institute
Dr. John Hutchings (CoI) (CSA Member)	Dominion Astrophysical Observatory
Deepashri Thatte (CoI)	Space Telescope Science Institute
Kathryn St.Laurent (CoI)	Space Telescope Science Institute
Dr. Laurent Marc MUGNIER (CoI) (ESA Member)	Office National d'Études et de Recherches Aérospatiales

### OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1		NIRISS Aperture Masking Interferometry	(1) NGC1068
	2		NIRISS Aperture Masking Interferometry	(3) HD15633
	3		NIRISS Aperture Masking Interferometry	(1) NGC1068
	4		NIRISS Aperture Masking Interferometry	(3) HD15633

### ABSTRACT

Ground-based imaging of the Narrow Line Region (NLR) of nearby Seyfert 2 Active Galactic Nucleus (AGN), NGC 1068, reveals substantial near-IR emission aligned along the axis of a biconical outflow. Clear evidence of dust emission at temperatures  $\sim 700\text{K}$  imply a heating mechanism acting locally, at distances of  $\sim$ few 10s pc away from the AGN central engine. At larger distances, the near-IR emission is roughly coincident with [OIII] emission observed from HST, and radio emission possibly due to a jet. Thus it has been suggested that a sheath of interacting material around the jet

## JWST Proposal 1260 (Created: Tuesday, August 29, 2023 at 5:00:09 PM Eastern Standard Time) - Overview

may be providing heating via photoionization. The highest angular resolution near-IR images, however, show a possible arc of emission, probably in the plane orthogonal to the jet, extremely close to the central point source ( $\sim 130$ mas). If real, the arc must be produced by mechanisms operating at the poorly-understood interface between the inflowing reservoir of material supplying the torus and central engine. Only NIRISS AMI observations can unambiguously detect or rule out the presence of the arc structure; we propose observations in F380M, F430M and F480M filters, yielding 65-70mas resolution across a sub-arcsecond field of view. We expect to measure the temperatures of a variety of clouds in the field, including the arc, with some objects as bright as  $L=7.7$ . The processes governing this region are critically responsible for the balance between inflowing material from the galaxy, outflowing material due to AGN feedback, and accretion onto the black hole itself. [abridged]

Observation IDs: DOYON\_80[00-11]

Partially Seq non-int with Program ID: 1200 (PI: Rameau) Observation IDs: DOYON\_400[0-5]

### **OBSERVING DESCRIPTION**

We will observe NGC 1068, an  $L'=7.7$  source at two orientations using NIRISS AMI. The observations must be separated by at least 15 degrees in position angle to provide adequate (u,v) plane coverage. Due to features in the (u,v) plane, actual permitted PA offsets cannot be fully specified in the explicit requirements, see comments for full permissions. Thus observations must be separated by  $\sim$ weeks. For each observation we will also observe HD15633 as a PSF calibrator. We need 3 filters to measure the temperatures of observed dust features in NGC 1068, with  $1e8$  photons in each filter. Gratadour et al. 2006 find the nuclear source is  $M'=6.6$ , which is nearly equivalent to F480M;  $L'=7.7$ , approximately equivalent to F380M and we interpolate to find F430M should be 7.2mag. Due to the brightness of the source, we use the 80x80 sub-array. Based on current chip performance and bad pixel placement, we do not require dithers.

In addition, we are coordinating with GTO ID: 1200, PI: Rameau on calibrator observations; our observation 4 (the longer calibrator observation) must be observed in a non-int seq with Rameau's program. This is not fully represented by this APT file, nor by the APT submitted under ID: 1200. The order of observations does not matter--our observations 3&4 can happen before our observations 1&2; in addition, Program 1200 can go before Program 1260 or vice versa. The brightness of our calibrator, HD15633 is estimated from WISE  $W1=5.56$  and  $W2=5.43$ ; program 1260 requires  $1e8$  photons for each filter at each visit for target and calibrator; program 1200 requires  $2.5e9$  photons in F480M in the non-int seq observation.

Total request is 4.4hr.

Proposal 1260 - Targets - NGC 1068 As Proving Ground for NIRISS AMI

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	NGC1068	RA: 02 42 40.7710 (40.6698792d) Dec: -00 00 47.84 (-.01329d) Equinox: J2000	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei, Active galaxies, Seyfert galaxies]</i>	Proper Motion RA: -51.227 mas/yr Proper Motion Dec: -51.617000031001226 mas/yr Epoch of Position: 2000
(3)	HD15633	RA: 02 30 45.2032 (37.6883467d) Dec: +00 15 20.71 (.25575d) Equinox: J2000	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> <i>Category=Calibration</i> <i>Description=[A stars, Point spread function]</i>		

Proposal 1260 - Observation 1 - NGC 1068 As Proving Ground for NIRISS AMI

Tue Aug 29 22:00:09 GMT 2023

<b>Observation</b>	<b>Proposal 1260, Observation 1</b> <b>Diagnostic Status: Warning</b> Observing Template: NIRISS Aperture Masking Interferometry Comments: Permissible PA offsets between Observation 1 and Observation 3 are: 15-105 degrees 150-165 degrees 195-285 degrees 330-345 degrees due to (u,v) plane coverage.																																													
	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Observation 1) Informational (Form): The Visit Planner and Spike may produce different schedulability results. (Visit 1:1) Informational (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.																																													
<b>Fixed Targets</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>NGC1068</td> <td>RA: 02 42 40.7710 (40.6698792d) Dec: -00 00 47.84 (-.01329d) Equinox: J2000</td> <td></td> <td></td> </tr> </tbody> </table> Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Galaxy Description=[Active galactic nuclei, Active galaxies, Seyfert galaxies]										#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous	(1)	NGC1068	RA: 02 42 40.7710 (40.6698792d) Dec: -00 00 47.84 (-.01329d) Equinox: J2000																												
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	#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID																																					
	1	F480M	NISRAPID	29	133	1	133	303.729	148223.1																																					
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# Proposal 1260 - Observation 1 - NGC 1068 As Proving Ground for NIRISS AMI

<b>PSF References</b>	Observation 2 (PSF Reference; Filters [F380M, F430M, F480M]) Additional Justification: false
<b>Special Requirements</b>	Offset -0.00459 arcsec, 0.01412 arcsec No Parallel Attachments Sequence Observations 1, 2, Non-interruptible Aperture PA Offset 1 from 3 by 15 to 105 Degrees (Same offsets in V3)

Proposal 1260 - Observation 2 - NGC 1068 As Proving Ground for NIRISS AMI

Tue Aug 29 22:00:09 GMT 2023

<b>Observation</b>	<p><b>Proposal 1260, Observation 2</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRISS Aperture Masking Interferometry</p>									
<b>Diagnostics</b>	(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>		<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>		
	(3)	HD15633	RA: 02 30 45.2032 (37.6883467d) Dec: +00 15 20.71 (.25575d) Equinox: J2000		Proper Motion RA: -51.227 mas/yr Proper Motion Dec: -51.617000031001226 mas/yr 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=Calibration</i></p> <p><i>Description=[A stars, Point spread function]</i></p>									
<b>Acquisition</b>	<b>#</b>	<b>Target</b>	<b>Acquisition Mode</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	SAME	AMIBRIGHT	F480M	NISRAPID	9	1	1	0.475	148223.8
<b>Template</b>	<b>Subarray</b>				<b>Direct Image</b>					
	SUB80				false					
<b>Dithers</b>	<b>#</b>	<b>Primary Dithers</b>				<b>Subpixel Positions</b>				
	1	NONE				NONE				
<b>Spectral Elements</b>	<b>#</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>	
	1	F480M	NISRAPID	10	132	1	132	112.242	148223.2	
	2	F430M	NISRAPID	7	148	1	148	92.352	148223.4	
	3	F380M	NISRAPID	4	174	1	174	69.196	148223.6	
<b>PSF References</b>	PSF Reference: true									

## Proposal 1260 - Observation 2 - NGC 1068 As Proving Ground for NIRISS AMI

### Special Requirements

Offset -0.00459 arcsec, 0.01412 arcsec  
No Parallel Attachments

Sequence Observations 1, 2, Non-interruptible

Proposal 1260 - Observation 3 - NGC 1068 As Proving Ground for NIRISS AMI

Tue Aug 29 22:00:09 GMT 2023

<b>Observation</b>	<p><b>Proposal 1260, Observation 3</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRISS Aperture Masking Interferometry</p>									
<b>Diagnostics</b>	<p>(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Observation 3) Informational (Form): The Visit Planner and Spike may produce different schedulability results.</p>									
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>		<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>		
	(1)	NGC1068	RA: 02 42 40.7710 (40.6698792d) Dec: -00 00 47.84 (-.01329d) Equinox: J2000							
	<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>Category=Galaxy</i></p> <p><i>Description=[Active galactic nuclei, Active galaxies, Seyfert galaxies]</i></p>									
<b>Acquisition</b>	<b>#</b>	<b>Target</b>	<b>Acquisition Mode</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	SAME	AMIBRIGHT	F480M	NISRAPID	19	1	1	0.93	148223.7
<b>Template</b>	<b>Subarray</b>				<b>Direct Image</b>					
	SUB80				false					
<b>Dithers</b>	<b>#</b>	<b>Primary Dithers</b>				<b>Subpixel Positions</b>				
	1	NONE				NONE				
<b>Spectral Elements</b>	<b>#</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>	
	1	F480M	NISRAPID	29	133	1	133	303.729	148223.1	
	2	F430M	NISRAPID	37	146	1	146	421.531	148223.3	
	3	F380M	NISRAPID	32	163	1	163	409.13	148223.5	
<b>PSF References</b>	<p>Observation 4 (PSF Reference; Filters [F380M, F430M, F480M])</p> <p>Additional Justification: false</p>									



## Proposal 1260 - Observation 3 - NGC 1068 As Proving Ground for NIRISS AMI

### Special Requirements

Offset -0.00459 arcsec, 0.01412 arcsec  
No Parallel Attachments

Sequence Observations 3, 4, Non-interruptible  
Aperture PA Offset 1 from 3 by 15 to 105 Degrees (Same offsets in V3)

Proposal 1260 - Observation 4 - NGC 1068 As Proving Ground for NIRISS AMI

Tue Aug 29 22:00:09 GMT 2023

<b>Observation</b>	<p><b>Proposal 1260, Observation 4</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRISS Aperture Masking Interferometry</p>									
<b>Diagnostics</b>	(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>		<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>		
	(3)	HD15633	RA: 02 30 45.2032 (37.6883467d) Dec: +00 15 20.71 (.25575d) Equinox: J2000		Proper Motion RA: -51.227 mas/yr Proper Motion Dec: -51.617000031001226 mas/yr Epoch of Position: 2000					
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<b>Acquisition</b>	<b>#</b>	<b>Target</b>	<b>Acquisition Mode</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	SAME	AMIBRIGHT	F480M	NISRAPID	9	1	1	0.475	148223.8
<b>Template</b>	<b>Subarray</b>					<b>Direct Image</b>				
	SUB80					false				
<b>Dithers</b>	<b>#</b>	<b>Primary Dithers</b>				<b>Subpixel Positions</b>				
	1	NONE				NONE				
<b>Spectral Elements</b>	<b>#</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>	
	1	F480M	NISRAPID	10	1642	1	1642	1396.225	148223.11	
	2	F430M	NISRAPID	7	148	1	148	92.352	148223.4	
	3	F380M	NISRAPID	4	174	1	174	69.196	148223.6	
<b>PSF References</b>	PSF Reference: true									

Proposal 1260 - Observation 4 - NGC 1068 As Proving Ground for NIRISS AMI

**Special Requirements**

Offset -0.00459 arcsec, 0.01412 arcsec  
No Parallel Attachments

Sequence Observations 3, 4, Non-interruptible