



9246 - Probing SF of nearby starburst nuclear rings at unprecedented resolution

Cycle: 4, Proposal Category: GO

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. Anan Lu (PI) (CSA Member)	University of British Columbia
Dr. Woorak Choi (CoI) (CSA Member) (CoPI) (Contact)	McMaster University
Dr. Martin Bureau (CoI) (ESA Member)	University of Oxford
Dr. Lijie Liu (CoI) (ESA Member)	Technical University of Denmark-DTU Space
Prof. Daryl Haggard (CoI) (CSA Member)	McGill University
Mr. Fu-Heng Liang (CoI) (ESA Member)	Astronomisches Rechen-Institut Heidelberg
Dr. Thomas Williams (CoI) (ESA Member)	University of Manchester
Dr. Ilaria Ruffa (CoI) (ESA Member)	Cardiff University
Dr. Timothy Andrew Davis (CoI) (ESA Member)	Cardiff University
Dr. Jindra Gensior (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy
Dr. Allison Man (CoI) (CSA Member)	University of British Columbia
Dr. Selcuk Topal (CoI)	Van Yuzuncu Yil University
Dr. Christine Wilson (CoI) (CSA Member)	McMaster University

OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1		NIRCam Imaging	(1) NGC-0613
	2		NIRCam Imaging	(2) NGC-1326
	3		NIRCam Imaging	(3) NGC-1365
	4		NIRCam Imaging	(4) NGC-613
	5		NIRCam Imaging	(5) NGC-4321

ABSTRACT

Much can be learnt about star formation (SF) by probing it beyond the conditions usually encountered in normal star-forming discs. Here we propose to build a sample of 10 starbursting nuclear rings with the most complete multiwavelength data at unprecedented spatial resolution. All targets have high resolution ALMA molecular gas observations, HST star cluster maps, low resolution SFR maps, and multi-band VLA observations to estimate the fraction of thermal/non-thermal emission. The 33 GHz radio continuum at the resolution of 0.3 arcsecond that can only be achieved by VLA B array is our best shot at obtaining high resolution extinction-free SFR maps of nearby galaxies that can reach the physical scale of GMCs and HII regions. By spatially resolving individual GMCs, HII regions and star clusters, we will constrain the detailed mechanisms regulating star formation (stellar feedback, gas availability, turbulence, inflow from the galactic bar, etc.) and probe a wide range of SFEs in environments analogous to the central molecular zone (CMZ) of our own Milky Way. We request six VLA observations to complete the sample, and JWST NIRcam imaging of five targets to further constrain SFR and cross-correlate with dust and PAH emission.

OBSERVING DESCRIPTION

We will observe a central region of 5 nearby galaxies using NIRCcam with Module B.

We will use 4 filter sets to trace Pa-alpha, Br-alpha, PAHs, and dust continuum. These star formation and dust tracers are crucial to investigate a nuclear ring where lots of dust and star formation exist.

We choose read-out patterns of SHALLOW4 and BRIGHT2 for narrow-band and broad-band observations, respectively.

Proposal 9246 - Observation 1 - Probing SF of nearby starburst nuclear rings at unprecedented resolution

Observation	Proposal 9246, Observation 1									Wed Apr 01 18:00:28 GMT 2026
	Diagnostic Status: Warning									
	Observing Template: NIRCam Imaging									
Diagnostics	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Miscellaneous		
	(1)	NGC-0613	RA: 10 38 45.8571 (159.6910712d)			Epoch of Position: 2000				
			Dec: +53 30 11.89 (53.50330d)							
			Equinox: J2000							
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.									
	Category=Galaxy									
	Description=[Barred spiral galaxies, Disk galaxies]									
Template	Module					Subarray				
	B					FULL				
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions
	1	INTRAMODULEBOX		4		STANDARD				1
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID
	1	F187N	F405N+F444W	SHALLOW4	8	1	4	4	1674.936	240818
	2	F164N+F150W2	F335M	SHALLOW4	5	1	4	4	1030.73	240818
	3	F150W	F430M	BRIGHT2	5	1	4	4	429.471	240818
	4	F200W	F300M	BRIGHT2	5	1	4	4	429.471	240818

Proposal 9246 - Observation 2 - Probing SF of nearby starburst nuclear rings at unprecedented resolution

Observation	Proposal 9246, Observation 2									Wed Apr 01 18:00:28 GMT 2026	
	Diagnostic Status: Warning										
	Observing Template: NIRCam Imaging										
Diagnostics	(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous		
	(2)	NGC-1326	RA: 03 23 56.3657 (50.9848571d) Dec: -36 27 52.32 (-36.46453d) Equinox: J2000			Proper Motion RA: 0.304 mas/yr Proper Motion Dec: -5.282999995870341 mas/yr Epoch of Position: 2000					
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.										
	SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.										
	Category=Galaxy Description=[Barred spiral galaxies, Disk galaxies]										
Template	Module					Subarray					
	B					FULL					
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions	
	1	INTRAMODULEBOX		4		STANDARD				1	
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID	
	1	F187N	F405N+F444W	SHALLOW4	8	1	4	4	1674.936	240818	
	2	F164N+F150W2	F335M	SHALLOW4	5	1	4	4	1030.73	240818	
	3	F150W	F430M	BRIGHT2	5	1	4	4	429.471	240818	
	4	F200W	F300M	BRIGHT2	5	1	4	4	429.471	240818	

Proposal 9246 - Observation 3 - Probing SF of nearby starburst nuclear rings at unprecedented resolution

Observation	Proposal 9246, Observation 3									Wed Apr 01 18:00:28 GMT 2026	
	Diagnostic Status: Warning										
Observing Template: NIRCam Imaging											
Diagnostics	(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)	NGC-1365	RA: 03 33 36.4580 (53.4019083d)			Epoch of Position: 2000					
			Dec: -36 08 26.37 (-36.14066d)								
			Equinox: J2000								
			Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.								
Template	Category=Galaxy										
	Description=[Barred spiral galaxies, Disk galaxies]										
Module						Subarray					
	B					FULL					
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions	
	1	INTRAMODULEBOX		4		STANDARD				1	
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID	
	1	F187N	F405N+F444W	SHALLOW4	8	1	4	4	1674.936	240818	
	2	F164N+F150W2	F335M	SHALLOW4	5	1	4	4	1030.73	240818	
	3	F150W	F430M	BRIGHT2	5	1	4	4	429.471	240818	
	4	F200W	F300M	BRIGHT2	5	1	4	4	429.471	240818	

Proposal 9246 - Observation 4 - Probing SF of nearby starburst nuclear rings at unprecedented resolution

Observation	Proposal 9246, Observation 4									Wed Apr 01 18:00:28 GMT 2026	
	Diagnostic Status: Warning										
	Observing Template: NIRCam Imaging										
Diagnostics	(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Miscellaneous			
	(4)	NGC-613	RA: 01 34 18.2350 (23.5759792d)			Epoch of Position: 2000					
			Dec: -29 25 6.56 (-29.41849d)								
			Equinox: J2000								
			Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.								
Template	Category=Galaxy										
	Description=[Barred spiral galaxies, Disk galaxies]										
Template	Module					Subarray					
	B					FULL					
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions	
	1	INTRAMODULEBOX		4		STANDARD				1	
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID	
	1	F187N	F405N+F444W	SHALLOW4	8	1	4	4	1674.936	240818	
	2	F164N+F150W2	F335M	SHALLOW4	5	1	4	4	1030.73	240818	
	3	F150W	F430M	BRIGHT2	5	1	4	4	429.471	240818	
	4	F200W	F300M	BRIGHT2	5	1	4	4	429.471	240818	

Proposal 9246 - Observation 5 - Probing SF of nearby starburst nuclear rings at unprecedented resolution

Observation	Proposal 9246, Observation 5									Wed Apr 01 18:00:28 GMT 2026	
	Diagnostic Status: Warning										
Observing Template: NIRCam Imaging											
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		
	(5)	NGC-4321	RA: 12 22 54.9300 (185.7288750d)			Proper Motion RA: 2.189 mas/yr					
			Dec: +15 49 20.30 (15.82231d)			Proper Motion Dec: 0.26 mas/yr					
			Equinox: J2000			Epoch of Position: 2000					
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.										
SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.											
Category=Galaxy											
Description=[Barred spiral galaxies, Disk galaxies]											
Template	Module					Subarray					
	B					FULL					
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions	
	1	INTRAMODULEBOX		4		STANDARD				1	
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID	
	1	F187N	F405N+F444W	SHALLOW4	8	1	4	4	1674.936	240818	
	2	F164N+F150W2	F335M	SHALLOW4	5	1	4	4	1030.73	240818	
	3	F150W	F430M	BRIGHT2	5	1	4	4	429.471	240818	
	4	F200W	F300M	BRIGHT2	5	1	4	4	429.471	240818	