



1266 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Cycle: 1, Proposal Category: GTO

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	GC_NIRSpec-1	NIRSpec IFU Spectroscopy	(1) GC-NIRSPEC-1
	2	GC_NIRSpec-2	NIRSpec IFU Spectroscopy	(7) GC-NIRSPEC-2
	3	GC_MIRI	MIRI Medium Resolution Spectroscopy	(2) GC-MIRI
	4	GC_background_MIRI	MIRI Medium Resolution Spectroscopy	(4) MIRI-GC-BCKGR-1
	5	GC_NIRSpec-1-Repeat	NIRSpec IFU Spectroscopy	(1) GC-NIRSPEC-1
	6	GC_NIRSpec-2-Repeat	NIRSpec IFU Spectroscopy	(7) GC-NIRSPEC-2
	7	GC_MIRI_Repeat	MIRI Medium Resolution Spectroscopy	(2) GC-MIRI
	8	GC_background_MIRI_Repeat	MIRI Medium Resolution Spectroscopy	(4) MIRI-GC-BCKGR-1

ABSTRACT

FERRUIT_4550 NIRSpec IFU Galactic Center

WRIGHT_7509 MIRI MRS Sag A*

WRIGHT_7510 MIRI MRS Sag A*_bg

At a distance of 8 kpc, the center of our galaxy is the closest galactic nucleus that can be studied. It harbors one of the two largest SMBH in projected size on the sky (see e.g. Eckart, Schoedel & Straubmeier 2005). The central stellar cluster, the S-stars, contain massive, young and luminous stars (e.g. Schödel et al. 2002; Ghez et al. 2003; Eisenhauer et al. 2005; Ghez et al. 2005) surrounding an interacting with SgrA*, the radio counterpart of the $4 \times 10^6 M$ super massive black hole (SMBH). In contrast to gas, the orbits of the stars are governed by gravitation only and therefore provide an excellent tracer for the gravitational potential in our Galactic center. This unique setup provides the best measurement of the mass of a black hole to date and unambiguously confirms the existence of a supermassive black hole in the center of our galaxy (Genzel et al. 2010). Schödel et al. (2002) and Ghez et al. (2003) carried out high resolution near-IR imaging and spectroscopy of the central region of our Milky Way. They found a star (nowadays known as S2) closely bound to a central massive object with an orbital period of 15.2 years (see also Gillessen et al. 2009a). The monitoring of its orbit for over 10 years provided the best observation of a Keplerian orbit around a massive black hole to date. Today, the number of well-determined orbits has risen from 1 to 28 while 109 stars in total are still being monitored (Gillessen et al. 2009b).

We propose to observe the Galactic Center using both NIRSpec and MIRI Integral Field Spectroscopy. This will not only provide an excellent opportunity to detect, for the first time, SgrA* in th MIR (likely dilution effects have made it impossible so far) but will give detailed 3D spectroscopic data in all the JWST spectral range to study the central stellar cluster in detail.

The original proposal requested a background target for MIRI (GC-BG-MIRI). After updates in the guide star catalog and increases in the guide star spoiler radius, we are not able to use that target as a background (cannot be schedule back-to-back). Here we propose three different background targets that can be scheduled.

This proposal links all the visits (MIRI and NIRSpec) in a sequence non-interruptible way. The galactic centre is highly variable target; one of the aspects we want to study are the S-stars. These stars move quickly and we want all the observations taken as close as possible to have them in the same stage.

OBSERVING DESCRIPTION

NIRSpec observations:

IFU 1x2 mosaic

TA method is VERIFY ONLY, the pointing verification MSA configuration is ALLCLOSED

The spectral configurations used are:

G235H/F170LP

G935H/F290LP

The IFU observations include a leakage exposure

In all exposures the readout mode is IRS2RAPID

The dither pattern is a 4pt cycling dither

MIRI Observations

Single pointing MRS observations with no simultaneous imaging (due to saturation risk)

The MRS is used in all bands with a 4pt dither pattern and FAST readout mode.

We have included a background pointing to be able to measure the telescope thermal emission.

The background observations use the same detector configuration and a 2 point dither pattern.

The observations use TA for both the GC and background source. At the moment APT requires mandatory TA for the MIRI MRS, but in the APT 25.4 version should be optional and we will not require it. The numbers provided in the MIRI TA sections are just placeholders not to have proposal errors.

Proposal 1266 - Targets - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GC-NIRSPEC-1	RA: 17 45 40.0410 (266.4168375d) Dec: -29 00 28.12 (-29.00781d) Equinox: J2000		
	<i>Comments:</i> Category=Galaxy Description=[Active galactic nuclei] Extended=NO			
(2)	GC-MIRI	RA: 17 45 40.0410 (266.4168375d) Dec: -29 00 28.12 (-29.00781d) Equinox: J2000		
	<i>Comments:</i> Category=Galaxy Description=[Active galactic nuclei] Extended=NO			
(3)	GC-BG-MIRI	RA: 17 45 39.8380 (266.4159917d) Dec: -28 59 16.98 (-28.98805d) Equinox: J2000		
	<i>Comments:</i> Category=Calibration Description=[Telescope/sky background]			
(4)	MIRI-GC-BCKGR-1	RA: 17 45 45.6298 (266.4401242d) Dec: -29 01 18.26 (-29.02174d) Equinox: J2000		
	<i>Comments:</i> Category=Calibration Description=[Telescope/sky background]			
(5)	MIRI-GC-BCKGR-2	RA: 17 45 39.0400 (266.4126667d) Dec: -29 01 21.79 (-29.02272d) Equinox: J2000		
	<i>Comments:</i> Category=Calibration Description=[Telescope/sky background]			
(6)	MIRI-GC-BCKGR-3	RA: 17 45 42.3270 (266.4263625d) Dec: -29 01 12.67 (-29.02019d) Equinox: J2000		
	<i>Comments:</i> Category=Calibration Description=[Telescope/sky background]			
(7)	GC-NIRSPEC-2	RA: 17 45 39.8086 (266.4158692d) Dec: -29 00 29.81 (-29.00828d) Equinox: J2000		
	<i>Comments:</i> Category=Galaxy Description=[Active galactic nuclei] Extended=NO			

Fixed Targets

Proposal 1266 - Observation 1 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Mon Jul 15 21:00:21 GMT 2024

Observation	<p>Proposal 1266, Observation 1: GC_NIRSpec-1</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
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)	GC-NIRSPEC-1	RA: 17 45 40.0410 (266.4168375d) Dec: -29 00 28.12 (-29.00781d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei]</i> <i>Extended=NO</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point		Number of Points		Points			
	1	CYCLING		SMALL	1		4					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	G235H/F170LP	NRSIRS2RAPI D	10	1	false	true	NONE	4	4	641.911	
	2	G235H/F170LP	NRSIRS2RAPI D	10	1	true	true	NONE	4	4	641.911	
	3	G395H/F290LP	NRSIRS2RAPI D	10	1	false	true	NONE	4	4	641.911	
	4	G395H/F290LP	NRSIRS2RAPI D	10	1	true	true	NONE	4	4	641.911	
Special Requirements	Sequence Observations 1, 2, 3, 4, Non-interruptible											

Proposal 1266 - Observation 2 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Mon Jul 15 21:00:21 GMT 2024

Observation	<p>Proposal 1266, Observation 2: GC_NIRSpec-2</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
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			
	(7)	GC-NIRSPEC-2	RA: 17 45 39.8086 (266.4158692d) Dec: -29 00 29.81 (-29.00828d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei]</i> <i>Extended=NO</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point		Number of Points		Points			
	1	CYCLING		SMALL	1		4					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	G235H/F170LP	NRSIRS2RAPI D	10	1	false	true	NONE	4	4	641.911	
	2	G235H/F170LP	NRSIRS2RAPI D	10	1	true	true	NONE	4	4	641.911	
	3	G395H/F290LP	NRSIRS2RAPI D	10	1	false	true	NONE	4	4	641.911	
	4	G395H/F290LP	NRSIRS2RAPI D	10	1	true	true	NONE	4	4	641.911	
Special Requirements	Sequence Observations 1, 2, 3, 4, Non-interruptible											

Proposal 1266 - Observation 3 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Mon Jul 15 21:00:21 GMT 2024

Observation	Proposal 1266, Observation 3: GC_MIRI Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Background Observations:[GC_background_MIRI (Obs 4)]												
	(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.												
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous				
	(2)	GC-MIRI	RA: 17 45 40.0410 (266.4168375d) Dec: -29 00 28.12 (-29.00781d) Equinox: J2000										
<i>Comments:</i> Category=Galaxy Description=[Active galactic nuclei] Extended=NO													
Acquisition	#	Target											
	1	NONE											
Template	AcqFilter	Primary Channel			Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	FND	All MRS			YES			FULL		NEUTRAL			
Dithers	#	Dither Type			Optimized For			Direction					
	1	4-Point			EXTENDED SOURCE			NEGATIVE					
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1		IMAGER	F560W	FASTR1	5	8	1	Dither 1	4	32	521.708	
	1	SHORT(A)	MRSLONG		FASTR1	15	3	1	Dither 1	4	12	521.708	
	1	SHORT(A)	MRSSHORT		FASTR1	15	3	1	Dither 1	4	12	521.708	
	2		IMAGER	F770W	FASTR1	5	8	1	Dither 1	4	32	521.708	
	2	MEDIUM(B)	MRSLONG		FASTR1	15	3	1	Dither 1	4	12	521.708	
	2	MEDIUM(B)	MRSSHORT		FASTR1	15	3	1	Dither 1	4	12	521.708	
	3		IMAGER	F1130W	FASTR1	5	8	1	Dither 1	4	32	521.708	
	3	LONG(C)	MRSLONG		FASTR1	15	3	1	Dither 1	4	12	521.708	
	3	LONG(C)	MRSSHORT		FASTR1	15	3	1	Dither 1	4	12	521.708	

Proposal 1266 - Observation 3 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Special Requirements

Sequence Observations 1, 2, 3, 4, Non-interruptible

Proposal 1266 - Observation 4 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Mon Jul 15 21:00:21 GMT 2024

Observation	Proposal 1266, Observation 4: GC_background_MIRI Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Background Observation For: [GC_MIRI (Obs 3)]												
	(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)	MIRI-GC-BCKGR-1	RA: 17 45 45.6298 (266.4401242d) Dec: -29 01 18.26 (-29.02174d) Equinox: J2000 <i>Comments:</i> Category=Calibration Description=[Telescope/sky background]										
Acquisition	#	Target											
	1	NONE											
Template	AcqFilter	Primary Channel			Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	FND	All MRS			YES			FULL		NEUTRAL			
Dithers	#	Dither Type				Optimized For				Direction			
	1	2-Point				EXTENDED SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1		IMAGER	F560W	FASTR1	5	8	1	Dither 1	2	16	260.854	
	1	SHORT(A)	MRSLONG		FASTR1	15	3	1	Dither 1	2	6	260.854	
	1	SHORT(A)	MRSSHORT		FASTR1	15	3	1	Dither 1	2	6	260.854	
	2		IMAGER	F770W	FASTR1	5	8	1	Dither 1	2	16	260.854	
	2	MEDIUM(B)	MRSLONG		FASTR1	15	3	1	Dither 1	2	6	260.854	
	2	MEDIUM(B)	MRSSHORT		FASTR1	15	3	1	Dither 1	2	6	260.854	
	3		IMAGER	F1130W	FASTR1	5	8	1	Dither 1	2	16	260.854	
	3	LONG(C)	MRSLONG		FASTR1	15	3	1	Dither 1	2	6	260.854	
	3	LONG(C)	MRSSHORT		FASTR1	15	3	1	Dither 1	2	6	260.854	

Proposal 1266 - Observation 4 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Special Requirements

Sequence Observations 1, 2, 3, 4, Non-interruptible

Proposal 1266 - Observation 5 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Mon Jul 15 21:00:21 GMT 2024

Observation	<p>Proposal 1266, Observation 5: GC_NIRSpec-1-Repeat</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</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			
	(1)	GC-NIRSPEC-1	RA: 17 45 40.0410 (266.4168375d) Dec: -29 00 28.12 (-29.00781d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei]</i> <i>Extended=NO</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point		Number of Points	Points				
	1	CYCLING		SMALL	1		4					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	G235H/F170LP	NRSIRS2RAPI D	10	1	false	true	NONE	4	4	641.911	
	2	G235H/F170LP	NRSIRS2RAPI D	10	1	true	true	NONE	4	4	641.911	
	3	G395H/F290LP	NRSIRS2RAPI D	10	1	false	true	NONE	4	4	641.911	
	4	G395H/F290LP	NRSIRS2RAPI D	10	1	true	true	NONE	4	4	641.911	
Special Requirements	Sequence Observations 5, 6, 7, 8, Non-interruptible											

Proposal 1266 - Observation 6 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Mon Jul 15 21:00:21 GMT 2024

Observation	<p>Proposal 1266, Observation 6: GC_NIRSpec-2-Repeat</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</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			
	(7)	GC-NIRSPEC-2	RA: 17 45 39.8086 (266.4158692d) Dec: -29 00 29.81 (-29.00828d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[Active galactic nuclei]</i> <i>Extended=NO</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point		Number of Points	Points				
	1	CYCLING		SMALL	1		4					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	G235H/F170LP	NRSIRS2RAPI D	10	1	false	true	NONE	4	4	641.911	
	2	G235H/F170LP	NRSIRS2RAPI D	10	1	true	true	NONE	4	4	641.911	
	3	G395H/F290LP	NRSIRS2RAPI D	10	1	false	true	NONE	4	4	641.911	
	4	G395H/F290LP	NRSIRS2RAPI D	10	1	true	true	NONE	4	4	641.911	
Special Requirements	Sequence Observations 5, 6, 7, 8, Non-interruptible											

Proposal 1266 - Observation 7 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Mon Jul 15 21:00:21 GMT 2024

Observation	Proposal 1266, Observation 7: GC_MIRI_Repeat Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Background Observations:[GC_background_MIRI_Repeat (Obs 8)]												
	(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.												
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous				
	(2)	GC-MIRI	RA: 17 45 40.0410 (266.4168375d) Dec: -29 00 28.12 (-29.00781d) Equinox: J2000			<i>Comments:</i> Category=Galaxy Description=[Active galactic nuclei] Extended=NO							
Acquisition	#	Target											
	1	NONE											
Template	AcqFilter	Primary Channel			Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	FND	All MRS			YES			FULL		NEUTRAL			
Dithers	#	Dither Type			Optimized For			Direction					
	1	4-Point			EXTENDED SOURCE			NEGATIVE					
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1		IMAGER	F560W	FASTR1	5	8	1	Dither 1	4	32	521.708	
	1	SHORT(A)	MRSLONG		FASTR1	15	3	1	Dither 1	4	12	521.708	
	1	SHORT(A)	MRSSHORT		FASTR1	15	3	1	Dither 1	4	12	521.708	
	2		IMAGER	F770W	FASTR1	5	8	1	Dither 1	4	32	521.708	
	2	MEDIUM(B)	MRSLONG		FASTR1	15	3	1	Dither 1	4	12	521.708	
	2	MEDIUM(B)	MRSSHORT		FASTR1	15	3	1	Dither 1	4	12	521.708	
	3		IMAGER	F1130W	FASTR1	5	8	1	Dither 1	4	32	521.708	
	3	LONG(C)	MRSLONG		FASTR1	15	3	1	Dither 1	4	12	521.708	
	3	LONG(C)	MRSSHORT		FASTR1	15	3	1	Dither 1	4	12	521.708	

Proposal 1266 - Observation 7 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Special Requirements

Sequence Observations 5, 6, 7, 8, Non-interruptible

Proposal 1266 - Observation 8 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Mon Jul 15 21:00:21 GMT 2024

Observation	Proposal 1266, Observation 8: GC_background_MIRI_Repeat Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Background Observation For: [GC_MIRI_Repeat (Obs 7)]												
	(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.												
Fixed Targets	#	Name	Target Coordinates				Targ. Coord. Corrections			Miscellaneous			
	(4)	MIRI-GC-BCKGR-1	RA: 17 45 45.6298 (266.4401242d) Dec: -29 01 18.26 (-29.02174d) Equinox: J2000 <i>Comments:</i> Category=Calibration Description=[Telescope/sky background]										
Acquisition	#	Target											
	1	NONE											
Template	AcqFilter	Primary Channel			Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	FND	All MRS			YES			FULL		NEUTRAL			
Dithers	#	Dither Type				Optimized For				Direction			
	1	2-Point				EXTENDED SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1		IMAGER	F560W	FASTR1	5	8	1	Dither 1	2	16	260.854	
	1	SHORT(A)	MRSLONG		FASTR1	15	3	1	Dither 1	2	6	260.854	
	1	SHORT(A)	MRSSHORT		FASTR1	15	3	1	Dither 1	2	6	260.854	
	2		IMAGER	F770W	FASTR1	5	8	1	Dither 1	2	16	260.854	
	2	MEDIUM(B)	MRSLONG		FASTR1	15	3	1	Dither 1	2	6	260.854	
	2	MEDIUM(B)	MRSSHORT		FASTR1	15	3	1	Dither 1	2	6	260.854	
	3		IMAGER	F1130W	FASTR1	5	8	1	Dither 1	2	16	260.854	
	3	LONG(C)	MRSLONG		FASTR1	15	3	1	Dither 1	2	6	260.854	
	3	LONG(C)	MRSSHORT		FASTR1	15	3	1	Dither 1	2	6	260.854	

Proposal 1266 - Observation 8 - NIRSpec & MIRI Integral-Field Spectroscopy of the Galactic Center

Special Requirements

Sequence Observations 5, 6, 7, 8, Non-interruptible