

1939 - The Galactic Center

Cycle: 1, Proposal Category: GO

INVESTIGATORS

Name	Institution	E-Mail
Dr. Jessica Ryan Lu (PI)	University of California - Berkeley	jlu.astro@berkeley.edu
Dr. Tuan Do (CoI)	University of California - Los Angeles	tdo@astro.ucla.edu
Dr. Andrea M. Ghez (CoI)	University of California - Los Angeles	ghez@astro.ucla.edu
Dr. Anna Ciurlo (CoI)	University of California - Los Angeles	ciurlo@astro.ucla.edu
Dr. Mark R. Morris (CoI)	University of California - Los Angeles	morris@astro.ucla.edu
Prof. Smadar Naoz (CoI)	University of California - Los Angeles	snaoz@astro.ucla.edu
Dr. Rainer Schoedel (CoI) (ESA Member)	Instituto de Astrofisica de Andalucia (IAA)	rainer@iaa.es
Dr. Devin Chu (CoI)	University of California - Los Angeles	dchu@astro.ucla.edu
Dr. Abhimat Krishna Gautam (CoI)	University of California - Los Angeles	abhimat@astro.ucla.edu
Dr. Matthew Hosek Jr. (CoI)	University of California - Los Angeles	mwhosek@gmail.com
Dr. Zhuo Chen (CoI)	University of Washington	zczhuo@uw.edu
William Blake Drechsler (CoI)	The University of Virginia	khj5gf@virginia.edu
Ruoyi Yin (CoI)	University of California - Berkeley	ruoyiyin_2022@berkeley.edu

OBSERVATIONS

02022	- 1111110110			
Folder	Observation	Label	Observing Template	Science Target
Observ	ation Folder			
	1	Images	NIRCam Imaging	(1) GALCEN
	2	Spectra	NIRSpec IFU Spectroscopy	(1) GALCEN
	12	Spectra Repeat of Observation 2	NIRSpec IFU Spectroscopy	(1) GALCEN
	3	Images	NIRCam Imaging	(1) GALCEN
	4	Images	NIRCam Imaging	(1) GALCEN

JWST Proposal 1939 (Created: Friday, February 3, 2023 at 4:01:02 PM Eastern Standard Time) - Overview

ABSTRACT

Studies of the Galactic Center routinely deliver breakthrough discoveries. However, our picture is far from complete. Webb is uniquely poised to answer a number of remaining questions including: (1) How do stars form so close to the super-massive black hole (SMBH) and do they have an unusual initial mass function? (2) Are the old stars missing or have they been tidally stripped, making them faint and hard to detect? (3) How are binary systems, including those with compact objects, created, destroyed, and merged around a SMBH? and (4) Is there a cusp of dark matter and stellar mass black holes around the SMBH? To address these questions, we require a thorough and accurate census of the different populations of stars within the nuclear star cluster, including spectral types and 3D kinematics. We propose to obtain NIRCam imaging of the central 2' (4.8 pc) and NIRSpec IFU spectroscopy of the central 9" (0.36 pc) in order to study the nuclear star cluster and its co-evolution with the SMBH.

OBSERVING DESCRIPTION

We propose to obtain NIRCam imaging of the central 2' (4.8 pc) and NIRSpec IFU spectroscopy of the central 9" (0.36 pc) of our Galaxy in order to study the nuclear star cluster and its co-evolution with the supermassive black hole.

The NIRCam imaging includes 4 filters (F115W, F212N, F323N, F405N) to provide deep, precise photometry used for distinguishing young and old stars, constructing precise reddening maps and reddening laws, and measuring the structure, IMF, and star formation history of the old and young nuclear star clusters. The F212N images will repeated 3 times over cycle 1 to measure proper motions for stars down to K=20 at better than 0.5 mas/yr (20 km/s). The astrometry will be use to measure the positions, proper motions, accelerations, and orbits of stars around the supermassive black hole and to measure the astrometric wobble of stars in binary systems. The three epochs of F212N imaging should be spread over cycle 1.

The NIRSpec IFU spectroscopy uses the higher-resolution G235H grating in the F170LP filter to obtain spectra from 1.6 - 3.3 microns for a 3x3 mosaic at the Galactic Center. The spectra will be used to precisely identify young and old stars and measure their radial velocities and metallicities. These observations will be used to construct the IMF for different dynamical sub-groups, to confirm binary candidates identified from astrometry, and measure the structure, dynamics, and metallicity distribution of the nuclear star cluster.

Proposal 1939 - Targets - The Galactic Center

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٨	# Name Target Coordinates		Target Coordinates	Targ. Coord. Corrections	Miscellaneous				
	(1) GALCEN RA: 17 45 40.0410 (266.4168375d)		RA: 17 45 40.0410 (266.4168375d)	Epoch of Position: 2015.5					
arg	Dec: -29 00 28.12 (-29.00/81d)								
⊨	Equinox: J2000								
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.								
ш	Description=[Stellar associations, Young star clusters]								
	Extended=	YES							

Pro		<u>939 - Observatio</u>		ctic Center								
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Observation	Comments.	Offset requirement witt need	a to be changea when F	A oj observation is kni	own.							
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Targets	(1)	GALCEN		410 (266.4168375d)		Epoch of Position: 20						
arg			Dec: -29 00 28.	12 (-29.00781d)								
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Template												
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Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID		
m	1	F115W	F323N+F322W2	BRIGHT2	5	2	24	12	2705.666			
Ele	2	F212N	F405N+F444W	BRIGHT2	5	1	12	12	1288.412			
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te	TA Method											
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ents	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
ΙĔ	1	G235H/F170LP	NRSRAPID	25	9	false	false	NONE	1	9	2512.404	
Spectral Elements	2	G235H/F170LP	NRSRAPID	25	3	true	false	NONE	1	3	837.468	

Pro	posal 19	939 - Observa	tion 12 - T	he Galactio	c Center							
Observation	Proposal 19 Diagnostic S	39, Observation 12: S Status: Warning Template: NIRSpec IFU	spectra Repeat o								Fri Feb 03 21	:01:02 GMT 2023
Diagnostics	(Visit 12:1) '(Visit 12:1) '	Warning (Form): Data Warning (Form): Over			t Planner has been ru	ın.						
<u></u>	#	Name	Tar	get Coordinates			Targ. Coord	. Corrections		Miscellaneous		
Fixed Targets	(1) GALCEN RA: 17 45 40.0410 (266.4168375d) Epoch of Position: 2015.5 Dec: -29 00 28.12 (-29.00781d) Equinox: J2000 Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Stellar Cluster Description=[Stellar associations, Young star clusters] Extended=YES											
te	TA Method											
Template	NONE											
ဒ္ဌ	Rows	Col	umns	Row O	verlap %	Column (Overlap %	Row shift	Colur	nn shift	Tile Order	
Mosaic	3	3		3.0		3.0		0.0	0.0		DEFAULT	
ည	#		Dither Type		Size		Starting Po	oint	Number of Poi	nts	Points	
Dithers	1		NONE									
ents	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
ΙĔ	1	G235H/F170LP	NRSRAPID	25	9	false	false	NONE	1	9	2512.404	
Spectral Elements	2	G235H/F170LP	NRSRAPID	25	3	true	false	NONE	1	3	837.468	

Proposal 1939 - Observation 3 - The Galactic Center Observation Proposal 1939, Observation 3: Images Fri Feb 03 21:01:02 GMT 2023 **Diagnostic Status: Warning** Observing Template: NIRCam Imaging Comments: Offset requirement will need to be changed when PA of observation is known. Note, PA of Image (Obs 3) should be equal to or flipped by 180 of PA (Obs 2) in order to produce multi-epoch astrometry over a maximal field of view. Changes of ~3 degrees in PA off of this requirement is fine. This requirement is not easily enterable when we don't know the PA of the first epoch. We will enter the PA constraints once the observing schedule is known. **Diagnostics** (Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 3:1) 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. Name **Target Coordinates** Targ. Coord. Corrections Miscellaneous **Fixed Targets** (1) **GALCEN** RA: 17 45 40.0410 (266.4168375d) Epoch of Position: 2015.5 Dec: -29 00 28.12 (-29.00781d) Equinox: J2000 Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Stellar Čluster Description=[Stellar associations, Young star clusters] Extended=YES Template Module Subarray ALL **FULL** Dithers **Primary Dithers Subpixel Positions Primary Dither Type Subpixel Dither Type Dither Size** INTRAMODULEBOX STANDARD 3 Spectral Elements Short Filter Readout Pattern **Total Integrations** Total Dithers **Total Exposure** ETC Wkbk.Calc Long Filter Groups/Int Integrations/Exp Time ID 5 12 12 F212N F405N+F444W BRIGHT2 1 1288.412 Special Requirements Aperture PA Range 266.9286469 to 281.9286469 Degrees (V3 267.0 to 282.0) Offset 70.0 arcsec, 17.0 arcsec 3 After 1 by 60 Days to <None specified> 4 After 3 by 60 Days to <None specified>

Proposal 1939 - Observation 4 - The Galactic Center

uo	Proposal 1939, Observation 4: I							Fri Feb	03 21:01:02 GMT 2023	
ati	Diagnostic Status: Warning									
≥	Observing Template: NIRCam In									
Observation	Comments: Offset requirement wi a maximal field of view. Changes observing schedule is known.	ll need to be changed when I of ~3 degrees in PA off of th	PA of observation is kn is requirement is fine. T	own. Note, PA of I This requirement is	mage (Obs 3) should be e s not easily enterable whe	qual to or flipped by 1 n we don't know the Pa	80 of PA (Obs 2) in A of the first epoch.	order to produce multi We will enter the PA co	epoch astrometry over onstraints once the	
cs	(Visit 4:1) Warning (Form): Over	heads are provisional until th	e Visit Planner has bee	en run.						
Diagnostics										
	# Name	Target Coord	inates		Targ. Coord. Correc	rtions	Misce	llaneous		
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ers	1	Primary Dither Type INTRAMODULEBOX	Primary Di	tners	STANDARD	ype Ditne	er Size	Subpixel Po	ositions	
Dithers	1	INTRAMODULEBOX	4		STANDARD			3		
Spectral Elements	# Short Filter	r Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID	
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