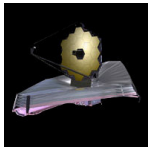

5354 - Mapping a Black Hole Accretion Flow with JWST/NIRSpec

Cycle: 3, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		NIRSpec IFU Spectroscopy	(1) NGC4696

ABSTRACT

We propose leveraging the unique capabilities of JWST's NIRSpec IFU to resolve the gas kinematics within the sphere of influence of the black hole in NGC 4696, the central dominant galaxy of the Centaurus cluster of galaxies. Due to its proximity, recent deep high-spatial-resolution HST images of NGC 4696 have, for the first time, revealed an intriguing swirl in the ionized gas that appears to lead directly to the black hole—providing a unique opportunity to understand black hole accretion processes and their relationship with galaxy scale. Our objectives include mapping the velocity structure of the swirl, comparing it with state-of-the-art MHD simulations, measuring the black hole's mass, examining Bondi accretion, probing radio jet interactions, and searching for hidden cooling flows. Overall, these observations will contribute significantly to our understanding of fundamental processes in galaxy evolution, notably supermassive black hole fueling and its connection to the host galaxy.

OBSERVING DESCRIPTION

We request 6.22 hours (charged time) of NIRSpec IFU observations with a spectral resolution of R~2700 to cover the central 3" by 3" region of NGC 4696 - the central dominant galaxy in the Centaurus Cluster. We propose to use the F170LP/G235H (1.66m-3.17m) filter to capture the ionized gas and vibro-rotational lines required to study the ionization mechanisms and kinematics in the gas. This will enable us to study the hydrogen recombination lines (Pa, Br and Br) and vibro-rotational lines (H2(2-1)S(1)2.248m, H2(1-0)S(0)2.223m, H2(1-0)S(3)2.122m, H2(1-0)S(2)2.034m). It will also include a wealth of coronal lines [SiVI], [AlIX], [CaVIII], [SiVII], [MgVIII]), and potentially lines predicted by hidden cooling flows. To obtain the minimal signal-to-noise ratio for our science goals, the ETC estimates that we need a total exposure time of 4.3 hours (or 6.22 hours of charged time). Additionally, we propose the NRSIRS2RAPID readout pattern and a 4-point dithering pattern in order to ensure optimal resolution since the source is extended.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NGC4696	RA: 12 48 49.2720 (192.2053000d) Dec: -41 18 39.30 (-41.31092d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=Clusters of Galaxies
Description=[Brightest cluster galaxies, Intracluster medium]
Extended=YES

Observation

Proposal 5354, Observation 1

Wed Apr 02 01:00:09 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

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)	NGC4696	RA: 12 48 49.2720 (192.2053000d) Dec: -41 18 39.30 (-41.31092d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=Clusters of Galaxies
Description=[Brightest cluster galaxies, Intracluster medium]
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	MEDIUM	1	10	

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	NRSIRS2	19	1	false	true	NONE	10	10	14005.334	175935
2	G235H/F170LP	NRSIRS2	19	1	true	false	NONE	1	1	1400.533	