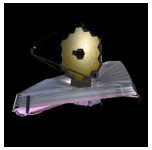

2162 - Does turbulence suppress star formation in AGN hosts?

Cycle: 1, Proposal Category: GO

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Nicole Nesvadba (PI) (ESA Member)	**Observatoire de la Cote d'Azur**	**nicole.nesvadba@oca.eu**

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Warm H2 in 3C326 N w/ NIRSPEC & MIRI				
	1	3C 326 N H2 1-0 S(3) NIRSPEC	NIRSpec IFU Spectroscopy	(3) Group 3C326N-SOURCEBG
	8	3C 326 N H2 0-0 S(3) MIRI	MIRI Medium Resolution Spectroscopy	(1) 3C326N
	9	3C 326 N H2 0-0 S(3) MIRI	MIRI Medium Resolution Spectroscopy	(2) 3C326N-BACKGROUND

ABSTRACT

It is not well understood how massive galaxies regulate their star formation, and hence inhibit rapid conversion of their gas into stars. Both AGN feedback and feedback from the star formation process itself are likely to contribute. The radio galaxy 3C 326N is a key target in resolving this issue because it contains a large mass of warm molecular gas that appears to be prevented from forming stars by large turbulent motions (seen in line widths of ~ 600 km/s on 1.0" scales), and that cannot be related to the AGN radiation, which is very faint. We have proposed that the turbulent motions are powered by the kinetic energy of the radio outflow, and that this is sufficient to inhibit star formation for 10^8 yr or longer. We now propose to measure the turbulent motions of the warm molecular gas at the diffraction limit of the JWST with NIRSPEC, which cannot be reached with ground-based adaptive-optics-assisted IFUs for this source. A central prediction for turbulent gas is that the line widths will remain high, FWHM~60 km/s down to these scales where, in absence of jet-driven turbulence, the gas should otherwise become gravitationally unstable and start to form stars. This is a simple observational test of a single source, which represents a direct test of a mechanism that has been proposed to be a

universal process regulating star formation in galaxies, but which is extremely challenging to observe in more complex systems, where star formation, AGN radiation, and radio jets co-exist. Demonstrating its validity even in a single object will therefore be an important complement to the large number of studies of warm H2 in active galaxies that MIRI will enable.

OBSERVING DESCRIPTION

We will use the NIRSPEC and MIRI IFUs to observe a nearby radio galaxy, 3c326n, in different tracers of warm molecular gas. The expected emission-line region is 1"x2" in size, small enough to fit into the FOVs of both instruments, even without blind offset from a star. Conservatively, though, in particular before in-flight constraints on the pointing accuracy are available, we are nodding towards a blank field with both instruments. We take a shallow frame at the position of the source to be able to correct for strong leakage from open shutters, if necessary.

Proposal 2162 - Targets - Does turbulence suppress star formation in AGN hosts?

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	3C326N	RA: 15 52 9.1120 (238.0379667d) Dec: +20 05 48.19 (20.09672d) Equinox: J2000	Proper Motion RA: 0.0 mas/yr Proper Motion Dec: 0.0 mas/yr Parallax: 0.0" Epoch of Position: 2000	
Comments: We have resolved seeing-limited SINFONI data of this source finding a size of 1"x2" for the gas disk. *Category=Galaxy* *Description=[Active galactic nuclei, Active galaxies, Radio galaxies]* *Extended=YES*				
(2)	3C326N-BACKGROUND	RA: 15 52 10.2240 (238.0426000d) Dec: +20 05 59.98 (20.09999d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Parallax: 0.0" Epoch of Position: 2000	
Comments: Blank sky aperture near the primary target. *Category=Calibration* *Description=[Telescope/sky background]*				
(3)	Group 3C326N-SOURCEBG			
Comments: *Target Selection=[1 3C326N, 2 3C326N-BACKGROUND]*				

Observation

Proposal 2162, Observation 1: 3C 326 N H2 1-0 S(3) NIRSPEC Wed Jan 11 08:00:25 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Background Observations:[]

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
(3)	Group 3C326N-SOURCEBG			

Comments:
Target Selection=[1 3C326N, 2 3C326N-BACKGROUND]

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	4-POINT-DITHER				

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	NRSIRS2RAPID	50	1	false	true	NONE	4	4	2976.134	63510.2
2	G235H/F170LP	NRSIRS2RAPID	10	1	true	false	NONE	1	1	160.478	

Observation

Proposal 2162, Observation 8: 3C 326 N H2 0-0 S(3) MIRI Wed Jan 11 08:00:25 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[3C 326 N H2 0-0 S(3) MIRI (Obs 9)]

Diagnostics

(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	3C326N	RA: 15 52 9.1120 (238.0379667d)	Proper Motion RA: 0.0 mas/yr	
		Dec: +20 05 48.19 (20.09672d)	Proper Motion Dec: 0.0 mas/yr	
		Equinox: J2000	Parallax: 0.0"	
			Epoch of Position: 2000	

Comments: We have resolved seeing-limited SINFONI data of this source finding a size of 1"x2" for the gas disk.
Category=Galaxy
Description=[Active galactic nuclei, Active galaxies, Radio galaxies]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray
F560W	CHANNEL2	NO	FULL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	LONG(C)	MRSLONG		FASTR1	35	1	1	Dither 1	4	4	388.506	63510.6
1	LONG(C)	MRSSHORT		FASTR1	35	1	1	Dither 1	4	4	388.506	63510.6

Special Requirements	Sequence Observations 8, 9, Non-interruptible

Observation

Proposal 2162, Observation 9: 3C 326 N H2 0-0 S(3) MIRI Wed Jan 11 08:00:25 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [3C 326 N H2 0-0 S(3) MIRI (Obs 8)]

Diagnostics

(Visit 9:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	3C326N-BACKGROUND	RA: 15 52 10.2240 (238.0426000d) Dec: +20 05 59.98 (20.09999d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Parallax: 0.0" Epoch of Position: 2000	

Comments: Blank sky aperture near the primary target.
Category=Calibration
Description=[Telescope/sky background]

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray
F560W	CHANNEL2	NO	FULL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	LONG(C)	MRSLONG		FASTR1	35	1	1	Dither 1	4	4	388.506	63510.6
1	LONG(C)	MRSSHORT		FASTR1	35	1	1	Dither 1	4	4	388.506	63510.6

Special Requirements	Sequence Observations 8, 9, Non-interruptible