



# 6074 - The First Measurement of AGN Feedback in Action in the First Billion Years

Cycle: 3, Proposal Category: GO

## INVESTIGATORS

<i>Name</i>	<i>Institution</i>
<b>Erini Lambrides (PI)</b>	<b>NASA Goddard Space Flight Center</b>
Dr. Marco Chiaberge (CoI) (ESA Member)	Space Telescope Science Institute - ESA - JWST
Prof. Caitlin M. Casey (CoI)	University of Texas at Austin
Dr. Jeyhan Kartaltepe (CoI)	Rochester Institute of Technology
Dr. Taylor Alexandra Hutchison (CoI)	NASA Goddard Space Flight Center
Dr. Massimo Stiavelli (CoI)	Space Telescope Science Institute
Arianna Long (CoI)	University of Washington
Jed McKinney (CoI)	University of Texas at Austin
Olivia Cooper (CoI)	University of Texas at Austin
Dr. Sinclair Manning (CoI)	University of Massachusetts - Amherst
Hollis Akins (CoI)	University of Texas at Austin
Dr. Colin A. Norman (CoI)	The Johns Hopkins University
Dr. Michaela Hirschmann (CoI) (ESA Member)	Ecole Polytechnique Federale de Lausanne
Dr. Andreas L Faisst (CoI)	California Institute of Technology
Namrata Roy (CoI)	The Johns Hopkins University
Dr. Eleni Vardoulaki (CoI) (ESA Member)	Max-Planck-Institut fur Radioastronomie
Dr. Anton M. Koekemoer (CoI)	Space Telescope Science Institute
Dr. Shuowen Jin (CoI) (ESA Member)	Technical University of Denmark-DTU Space
Dr. Jorge Zavala (CoI)	National Astronomical Observatory of Japan (NAOJ)
Dr. Maximilien Franco (CoI)	University of Texas at Austin
Dr. Vincenzo Mainieri (CoI) (ESA Member)	European Southern Observatory - Germany
Dr. Christopher Hayward (CoI)	Simons Foundation Center for Computational Astrophysics
Mr. Santosh Harish (CoI)	Rochester Institute of Technology

<i>Name</i>	<i>Institution</i>
Dr. Ross Silver (CoI)	NASA Goddard Space Flight Center
Kelly E Whalen (CoI)	NASA Goddard Space Flight Center
Dr. Andrew Ptak (CoI)	NASA Goddard Space Flight Center
Dr. Alessandro Capetti (CoI) (ESA Member)	Osservatorio Astronomico di Torino
Prof. Georgios Magdis (CoI) (ESA Member)	Technical University of Denmark-DTU Space
Dr. John David Silverman (CoI)	The Johns Hopkins University
Dr. Brian Welch (CoI)	University of Maryland

### OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
NIRSpec IFU				
	1		NIRSpec IFU Spectroscopy	(1) COSMOSVLA-J100104.51+020203.6

### ABSTRACT

Early results from JWST have raised more questions than answers on the prevalence, growth, and impact of growing SMBHs (referred to as AGN) during Cosmic Dawn. With most JWST studies finding extreme over-abundances of AGN relative to predictions, the impact of these high- $z$  powerfully accreting sources on the formation history of their nascent host-galaxies is unknown. We propose for NIRSpec IFU G395M/F290LP (Total Science Exposure Time  $\sim 6$  hours) to observe the only known  $z > 7$  heavily obscured radio-loud AGN candidate (COSW-106725,  $z \sim 7.7$ ). As highlighted in the proposal, heavily obscured RL AGN are the ideal candidates for efficiently testing AGN feedback paradigms during the Epoch of Reionization. These proposed observations will provide the first robust constraints on the effect of AGN activity on nascent early galaxy evolution without significant contamination from the central engine. We will constrain, for the first time, the level of ionized AGN contribution on the clumpy, dense, un-settled ISM of an early massive galaxy via [OIII], H $\beta$ , and optical continuum measurements on 500pc scales. From hunting for fast-moving outflowing ionized gas to mapping the different sources of ionization across the galaxy's extent, these measurements will allow for unprecedented constraints on the true extent of AGN impact on a young, massive galaxy. This proposal will pave the way forward for future observations of larger sample sizes, and will enable for the first time, greater understanding on the consequence of early Universe growing SMBHs on the evolution of massive galaxies.

### OBSERVING DESCRIPTION

We propose for NIRSpec IFU G395M/F290LP to observe the only known  $z > 7$  heavily obscured radio-loud AGN candidate (COSW-106725). Conservatively using a medium background noise level, we set up our ETC calculations using the full detector paired with the NRSIRS2 readout

## JWST Proposal 6074 (Created: Friday, July 19, 2024 at 12:01:35 PM Eastern Standard Time) - Overview

mode, chosen to reduce detector noise and lower the data volume as best we can. For our exposures, we chose a combination of 37 groups per integration, 2 integration per exposure, and 4 dithers, achieving a total science time of 6hrs and 1min on the science target. Our total science time is partially driven by obtaining a S/N in the integrated 4  $\mu\text{m}$  continuum of at least  $S/N > 5$  within the half-light radius of the galaxy ( $\sim 0.3''$ ). This S/N not only does ensures robust detections of the lines of interest, but most importantly, it provides a resolved constraint on the level of star-formation in the galaxy without AGN contamination.

We chose to not have a PA constraint for our observations, as any angle is acceptable for keeping the target source within the NIRSpec IFU 3x3 arcmin field of view.

Additionally, we chose not to include a dedicated IFU background pointing for our observations, based upon results from ERS collaborations showing that a dedicated background pointing is not necessary for the medium- and high-resolution gratings (e.g., TEMPLATES ERS collaboration, private comm.).

Fortuitously, our target has a great amount of flexibility in scheduling windows, with the majority of the observing window being not impacted by the micrometeorite avoidance zone scheduling.

# Proposal 6074 - Targets - The First Measurement of AGN Feedback in Action in the First Billion Years

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	COSMOSVLA- J100104.51+020203.6	RA: 10 01 4.5490 (150.2689542d) Dec: +02 02 3.81 (2.03439d) Equinox: J2000	Epoch of Position: 2000	
<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>Category=Galaxy</i></p> <p><i>Description=[Active galactic nuclei, High-redshift galaxies]</i></p> <p><i>Extended=YES</i></p>					

Proposal 6074 - Observation 1 - The First Measurement of AGN Feedback in Action in the First Billion Years

Fri Jul 19 17:01:35 GMT 2024

<b>Observation</b>	<b>Proposal 6074, Observation 1</b> <b>Diagnostic Status: Warning</b> Observing Template: NIRSpec IFU Spectroscopy											
	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
<b>Fixed Targets</b>	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(1)	COSMOSVLA- J100104.51+020203.6	RA: 10 01 4.5490 (150.2689542d) Dec: +02 02 3.81 (2.03439d) Equinox: J2000			Epoch of Position: 2000						
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Galaxy Description=[Active galactic nuclei, High-redshift galaxies] Extended=YES												
<b>Template</b>	<b>TA Method</b>											
	NONE											
<b>Dithers</b>	#	Dither Type		Size	Starting Point		Number of Points		Points			
	1	CYCLING		SMALL	1		8					
<b>Spectral Elements</b>	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	G395M/F290LP	NRSIRS2	37	1	false	true	NONE	8	8	21708.268	175621.4