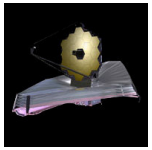

11687 - EXHALE: Expelling the X-ray High-energy winds to InfrAred-traced gaLactic scale fEedback - Tracing multiphase outflows in Mrk 877

Cycle: 5, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Xin Xiang (PI)	**University of Michigan**
Dr. Jon Matthew Miller (CoI) (CoPI)	University of Michigan
Dr. Feige Wang (CoI)	University of Michigan
Dr. Jinyi Yang (CoI)	University of Michigan
Prof. Sylvain Veilleux (CoI)	University of Maryland
Dr. Elena Gallo (CoI)	University of Michigan
Dr. Xiangyu Jin (CoI)	University of Michigan
Dr. Doyee Byun (CoI)	University of Michigan

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	Mrk877-NIRSpec	NIRSpec IFU Spectroscopy	(3) Mrk877-NIRSPEC
	2	Mrk877-MIRI	MIRI Medium Resolution Spectroscopy	(1) Mrk877-MIRI
	3	Mrk877-MIRI-BACKGROUND	MIRI Medium Resolution Spectroscopy	(2) Mrk877-MIRI-BACKGROUND

ABSTRACT

EXHALE (Expelling the X-ray High-energy winds to InfrAred-traced gaLactic scale fEedback) is a pilot JWST program designed to trace how X-ray-detected Ultra-Fast Outflows (UFOs) couple to the host interstellar medium and regulate star formation. The nearby quasar Mrk 877 (z = 0.11) hosts a confirmed UFO detected by XMM-Newton, making it an ideal step to study how accretion-driven winds evolve into large-scale feedback.

Using JWST/NIRSpec IFU and MIRI MRS, EXHALE will map the kinematics and excitation of the ionized, coronal, and molecular gas outflows through key infrared tracers on sub-kpc scales. Mrk 877 bridges the gap between most luminous quasars like PDS 456 and more typical Seyferts like NGC 4151, offering a unique test of AGN feedback efficiency. By combining X-ray UFO energetics with JWST-resolved outflow diagnostics, EXHALE will provide one of a few views of multi-phase wind coupling and establish a methodological benchmark for a future JWST survey connecting accretion-driven winds to star-formation quenching in galaxies.

OBSERVING DESCRIPTION

We will observe Mrk 877 using the NIRSpec and MIRI IFUs with the following settings:

-NIRSpec IFU with G235H/F170LP

Target acquisition starts on the quasar itself with the WATA/F140X filter

9 Cycle dither pattern

15 groups and 3 integrations per dither position

Readout mode: NRSRAPID

--> total exposure time on source: 4638.28 sec

1 leakage exposure at 1 dither position: 515.36 sec

-MIRI IFU with the SHORT, MEDIUM, and LONG wavelength settings

4-point all-wavelength extended source dither pattern

35 groups and 7 integrations per dither position for each wavelength setting

Readout mode: FAST

--> total exposure time on source: 3 x 2786.145 s = 8358.42 sec

1 off-source background data cube

(obtained immediately after the on-source cube using the same settings as the on-source data cube)

--> total exposure time on background: 3 x 2786.145 s = 8358.42 sec

--> exposure time for simultaneous interspaced F770W images: 85.46 sec each

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	Mrk877-MIRI	RA: 16 20 11.2800 (245.0470000d) Dec: +17 24 27.52 (17.40764d) Equinox: J2000	Proper Motion RA: 0.02 mas/yr Proper Motion Dec: -0.020999982552893925 mas/yr Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.* *Category=Galaxy* *Description=[Active galactic nuclei, Active galaxies, Quasars, Seyfert galaxies]* *Extended=YES*				
(2)	Mrk877-MIRI-BACKGROUND	RA: 16 20 11.2800 (245.0470000d) Dec: +17 25 28.00 (17.42444d) Equinox: J2000	Epoch of Position: 2000	
Comments: *Category=Unidentified* *Description=[Blank field]* *Extended=YES*				
(3)	Mrk877-NIRSPEC	RA: 16 20 11.2800 (245.0470000d) Dec: +17 24 27.52 (17.40764d) Equinox: J2000	Proper Motion RA: 0.02 mas/yr Proper Motion Dec: -0.020999982552893925 mas/yr Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.* *Category=Galaxy* *Description=[Active galactic nuclei, Active galaxies, Quasars, Seyfert galaxies]*				

Observation

Proposal 11687, Observation 1: Mrk877-NIRSpec Fri Mar 13 21:09:15 GMT 2026

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
(3)	Mrk877-NIRSPEC	RA: 16 20 11.2800 (245.0470000d)	Proper Motion RA: 0.02 mas/yr	
		Dec: +17 24 27.52 (17.40764d)	Proper Motion Dec: -0.020999982552893925 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Galaxy
Description=[Active galactic nuclei, Active galaxies, Quasars, Seyfert galaxies]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	3 Mrk877-NIRSPEC	WATA	SUB32	F140X	NRSRAPID	3	1	1	0.08	267744

Template

HFF Readout Mode
false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	MEDIUM	1	9	

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	G235H/F170LP	NRSRAPID	15	3	false	true	NONE	9	27	4638.285	267744
2	G235H/F170LP	NRSRAPID	15	3	true	false	NONE	1	3	515.365	267744

Observation

Proposal 11687, Observation 2: Mrk877-MIRI Fri Mar 13 21:09:15 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[Mrk877-MIRI-BACKGROUND (Obs 3)]

Diagnostics

(Visit 2:1) Warning (Form): Data Excess over lower threshold

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	Mrk877-MIRI	RA: 16 20 11.2800 (245.0470000d)	Proper Motion RA: 0.02 mas/yr	
		Dec: +17 24 27.52 (17.40764d)	Proper Motion Dec: -0.020999982552893925 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Galaxy
Description=[Active galactic nuclei, Active galaxies, Quasars, Seyfert galaxies]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
FND	All MRS	YES	SUB64	Allow Auto Reorder

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	Optional ETC ID
1		IMAGER	F770W	FASTR1	35	7	1	Dither 1	4	28	85.46	267744
1	SHORT(A)	MRSLONG		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744
1	SHORT(A)	MRSSHORT		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744
2		IMAGER	F770W	FASTR1	35	7	1	Dither 1	4	28	85.46	267744
2	MEDIUM(B)	MRSLONG		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744
2	MEDIUM(B)	MRSSHORT		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744
3		IMAGER	F770W	FASTR1	35	7	1	Dither 1	4	28	85.46	267744
3	LONG(C)	MRSLONG		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744
3	LONG(C)	MRSSHORT		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744

Special Requirements	Sequence Observations 2, 3, Non-interruptible

Observation

Proposal 11687, Observation 3: Mrk877-MIRI-BACKGROUND Fri Mar 13 21:09:15 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [Mrk877-MIRI (Obs 2)]

Diagnostics

(Visit 3:1) Warning (Form): Data Excess over lower threshold

(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)	Mrk877-MIRI-BACKGROUND	RA: 16 20 11.2800 (245.0470000d) Dec: +17 25 28.00 (17.42444d) Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Unidentified
Description=[Blank field]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	YES	SUB64	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	BACKGROUND	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1		IMAGER	F770W	FASTR1	35	7	1	Dither 1	4	28	85.46	267744
1	SHORT(A)	MRSLONG		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744
1	SHORT(A)	MRSSHORT		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744
2		IMAGER	F770W	FASTR1	35	7	1	Dither 1	4	28	85.46	267744
2	MEDIUM(B)	MRSLONG		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744
2	MEDIUM(B)	MRSSHORT		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744
3		IMAGER	F770W	FASTR1	35	7	1	Dither 1	4	28	85.46	267744
3	LONG(C)	MRSLONG		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744
3	LONG(C)	MRSSHORT		FASTR1	35	7	1	Dither 1	4	28	2786.14	267744

Special Requirements	Sequence Observations 2, 3, Non-interruptible