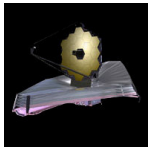

5637 - High-resolution mapping of the very cold superwind in ESO484-036

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Barbara Mazzilli Ciraulo (PI)	**Swinburne University of Technology**
Dr. Deanne B Fisher (CoI) (Contact)	Swinburne University of Technology
Prof. Alberto Bolatto (CoI) (US Admin CoI) (Contact)	University of Maryland
Michael Richard Hayden (CoI)	University of Sydney
Dr. Jesse van de Sande (CoI)	University of New South Wales Sydney
Dr. Marie Martig (CoI) (ESA Member)	Liverpool John Moores University
Dr. Boris Trahin (CoI)	Space Telescope Science Institute
Dr. Francoise Combes (CoI) (ESA Member)	Observatoire de Paris
Dr. Amelia Fraser-McKelvie (CoI) (ESA Member)	European Southern Observatory - Germany

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	MIRI imaging of ESO484036	MIRI Imaging	(1) ESO-484-36
	4	MIRI BKG imaging of ESO484036	MIRI Imaging	(2) ESO-484-36-BKG
	3	MIRI Short imaging of ESO484036	MIRI Imaging	(1) ESO-484-36
	2	NIRCam imaging of ESO484-036	NIRCam Imaging	(1) ESO-484-36
	5	NIRCam Short imaging of ESO484-036	NIRCam Imaging	(1) ESO-484-36

ABSTRACT

Galactic-scale winds play a key role in regulating star formation by removing gas from the disk, and are a top-tier component to all models of galaxy evolution. Despite this fact, there is no theoretical consensus for how, and how effectively, galactic winds actually remove the gas. Moreover, observations of winds are quite rare, and typically focus on the nearest outflows, which have similar properties. What theory does to describe the energetics of this important process is constrained by a small number of galaxies. We need more observations of the full range of outflows in order to properly include them in galaxy evolution models, especially those at describing the z>1 Universe when star formation was much more extreme. We propose to use JWST for an in-depth analysis of ESO484-036, a nearby starburst that hosts a galactic-scale wind with neutral Na D emission extending over multiple kiloparsecs. This is a rare feature, implying the wind is much colder and more dust rich than other outflows. Theory argues that cooling is a key physical mechanism setting outflow kinematics, which makes this target specifically interesting. We will use MIRI and NIRCam imaging to resolve the small-scale structure of the wind, and to identify dust heating and destruction in the wind using PAH line ratios. Existing VLT/MUSE and in progress ALMA observations make this project the first multiphase study of a Na I D emission outflow. ESO484-036 is expected to have a much colder wind, comparison to Cycle 1 observations of outflow galaxies M82 and NGC253 will suggest trends in cloud scale properties of outflows with the total cold gas mass.

OBSERVING DESCRIPTION

The primary objective of the program is to conduct a thorough analysis of the cold galactic wind hosted in ESO484-036. We use NIRCam imaging and MIRI imaging. The main aims of the project are to characterise the small-scale substructure of the wind and study the PAH abundances and line ratios. Since we target both the bright regions in the disk and the faint filaments in the wind, we include a short exposure to be used for the disk and avoid saturation, and a longer exposure to target the fainter emission in the wind. We will describe each instrument use below.

MIRI : The MIRI imaging uses F770W, F1130W and F2100W. The two first filters will measure the PAH feature and the third one targets the warm dust continuum. The MIRI field of view will cover the disk and the wind. For the shallow observations we use 6-dithers with CYCLING pattern, on 5 Groups per integration and 1 integration per exposure, using the SUB256 subarray. For the extended observations, we use 30 Groups/integration, 1 integration/exposure, and the FULL subarray; in order to get sufficient S/N on the regions where the wind is observed in the VLT/MUSE observations. We have placed the MIRI imaging into an uninterruptible sequence in order to couple to the background exposures.

NIRCam : The NIRCam imaging, with Module B, uses F335M to capture the small grain PAH emission. F150W, F200W and F430M are used to have a very good estimate of the stellar continuum. Again, we employ a strategy in which we take long integrations to target the emission in the

wind. For these, we use 3 primary dithers and 3 small dithers, on 5 Groups/integration, 1 integration/exposure. We use the FULL subarray and the MEDIUM2 readout pattern. For the shallow imaging, we use 3 primary and 3 small dithers as well, but 4 Groups/integration, 1 integration/exposure and the SUB640 subarray with the RAPID readout pattern.

Proposal 5637 - Targets - High-resolution mapping of the very cold superwind in ESO484-036

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	ESO-484-36	RA: 04 35 39.2760 (68.9136500d) Dec: -25 07 58.32 (-25.13287d) Equinox: J2000	Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Galaxy* *Description=[Emission line galaxies, Starburst galaxies]*				
(2)	ESO-484-36-BKG	RA: 04 35 29.7861 (68.8741088d) Dec: -25 05 20.75 (-25.08910d) Equinox: J2000	Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Galaxy* *Description=[Emission line galaxies, Starburst galaxies]*				

Observation

Proposal 5637, Observation 1: MIRI imaging of ESO484036 Mon Aug 19 13:00:10 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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)	ESO-484-36	RA: 04 35 39.2760 (68.9136500d) Dec: -25 07 58.32 (-25.13287d) Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Emission line galaxies, Starburst galaxies]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	6						DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	30	1	1	Dither 1	6	6	499.507	171780
2	F1130W	FASTR1	30	1	1	Dither 1	6	6	499.507	171780
3	F2100W	FASTR1	30	1	1	Dither 1	6	6	499.507	171780

Special Requirements

Sequence Observations 1, 3, 4, Non-interruptible

Observation

Proposal 5637, Observation 4: MIRI BKG imaging of ESO484036 Mon Aug 19 13:00:10 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	ESO-484-36-BKG	RA: 04 35 29.7861 (68.8741088d) Dec: -25 05 20.75 (-25.08910d) Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Emission line galaxies, Starburst galaxies]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	3						DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	30	1	1	Dither 1	3	3	249.754	
2	F1130W	FASTR1	30	1	1	Dither 1	3	3	249.754	
3	F2100W	FASTR1	30	1	1	Dither 1	3	3	249.754	

Special Requirements

Sequence Observations 1, 3, 4, Non-interruptible

Observation

Proposal 5637, Observation 3: MIRI Short imaging of ESO484036 Mon Aug 19 13:00:10 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	ESO-484-36	RA: 04 35 39.2760 (68.9136500d) Dec: -25 07 58.32 (-25.13287d) Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Emission line galaxies, Starburst galaxies]

Template

Subarray
SUB256

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	6						DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	5	1	1	Dither 1	6	6	8.986	171780
2	F1130W	FASTR1	5	1	1	Dither 1	6	6	8.986	171780
3	F2100W	FASTR1	5	1	1	Dither 1	6	6	8.986	171780

Special Requirements

Sequence Observations 1, 3, 4, Non-interruptible

Observation

Proposal 5637, Observation 2: NIRCam imaging of ESO484-036 Mon Aug 19 13:00:10 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(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)	ESO-484-36	RA: 04 35 39.2760 (68.9136500d) Dec: -25 07 58.32 (-25.13287d) Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Emission line galaxies, Starburst galaxies]

Template

Module	Subarray
B	FULL

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRAMODULEX	3	STANDARD		3

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F150W	F335M	MEDIUM2	5	1	9	9	4058.499	177063
2	F200W	F430M	MEDIUM2	5	1	9	9	4058.499	177063

Observation

Proposal 5637, Observation 5: NIRCam Short imaging of ESO484-036 Mon Aug 19 13:00:10 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	ESO-484-36	RA: 04 35 39.2760 (68.9136500d) Dec: -25 07 58.32 (-25.13287d) Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Emission line galaxies, Starburst galaxies]

Template

Module	Subarray
B	SUB640

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRAMODULEBOX	3	STANDARD		3

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F150W	F335M	RAPID	4	1	9	9	188.547	177063
2	F200W	F430M	RAPID	4	1	9	9	188.547	177063