



# 8564 - Staring at the Void: Supernova-Driven Star Formation and Supression in the Largest Local Superbubble

Cycle: 4, Proposal Category: GO

## INVESTIGATORS

<i>Name</i>	<i>Institution</i>
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Dr. Mederic Boquien (CoI) (ESA Member)	Universite Cote d'Azur
Dr. Daniel Dale (CoI)	University of Wyoming
Dr. Francesco Belfiore (CoI) (ESA Member)	INAF - Osservatorio Astrofisico di Arcetri
Mr. Andrea Romanelli (CoI) (ESA Member)	Universitat Heidelberg
Prof. Laura Lopez (CoI)	The Ohio State University
Dr. Erik Rosolowsky (CoI) (CSA Member)	University of Alberta
Dr. Eric Emsellem (CoI) (ESA Member)	European Southern Observatory - Germany

**OBSERVATIONS**

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Target 1				
	1	A NIRSpec	NIRSpec IFU Spectroscopy	(100) Group Phantom_Void_Rim-A
	2	A MIRI IFU	MIRI Medium Resolution Spectroscopy	(100) Group Phantom_Void_Rim-A
	3	B NIRSpec	NIRSpec IFU Spectroscopy	(101) Group Phantom_Void_Rim-B
	6	B MIRI IFU	MIRI Medium Resolution Spectroscopy	(101) Group Phantom_Void_Rim-B
	5	C NIRSpec	NIRSpec IFU Spectroscopy	(102) Group Phantom_Void_Rim-C
	4	C MIRI IFU	MIRI Medium Resolution Spectroscopy	(102) Group Phantom_Void_Rim-C

**ABSTRACT**

The Phantom Void is one of the most visually striking features in JWST images of nearby spiral galaxies. It is a uniquely large (more than 1 kpc in diameter), circular hole in the ISM of the nearby galaxy NGC 628 (the Phantom Galaxy), created by the extreme feedback from thousands of supernovae. Gas and dust have been concentrated on the perimeter of the Phantom Void, leading to new generations of stars forming along its rim. And yet, much of this gas is not currently forming stars, highlighting the contrasting role that feedback plays, and the fine balance between processes that concentrate gas and those that disperse it. We propose 3-27 micron NIRSPEC and MIRI IFU spectroscopy along 1/4 the perimeter of the Phantom Void to understand the role that supernovae-driven bubbles play on the gas-stars-feedback cycle in star-forming galaxies. When combined with ultra high resolution CO (2-1) maps of the Void, we will create temporal and spatial maps of star formation, warm molecular gas, PAH strengths and ratios, and identify regions where the gas has been shocked vs. radiatively heated. We will use the observations to address key questions: How does supernova feedback alter conditions for star formation in the cold ISM? Why is star formation not occurring simultaneously along the entire Void perimeter? How do supernova-driven shocks affect the survival and state of PAH grains?

**OBSERVING DESCRIPTION**

We target 6 slightly overlapping fields plus a background right in the center of the Void (which is a massive hole in the ISM) around the rim of the Phantom Void (in the nearby spiral galaxy NGC 628) with NIRSpec and MIRI IFU continuous spectroscopy from 3-28 microns.

NIRSpec IFU observations are linked in three separate uninterruptible groups (with pointings 1+2, 3+4+5, 6+'background' together) to prevent data overflow, since we require fairly long exposures to measure faint H2 lines in faint gas. The observations are taken in a 4 point dither pattern with the G395M/F290LP grating, and there are 15 groups with 3 integrations using the NRSIR2RAPID mode. Leakcals are associated with each pointing and have the same dither pattern and exposure time as the main pointing. We are using a pointing at the center of the void itself as a background field,

which saves slew time and also gives a very local measurement.

MIRI MRS IFU observations follow NIRSpec and are similarly divided into 3 linked uninterruptable sequences using a 4-point dither pattern, with a leakcal associated with each pointing. These obtain 20 group FASTR1 observations

We also obtain simultaneous MIRI imaging, with 20 group FASTR1 observations in F560W, F1280W, and F1500W. We do not impose a spacecraft roll angle requirement.

Proposal 8564 - Targets - Staring at the Void: Supernova-Driven Star Formation and Supression in the Largest Local Superbubble

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	phantom_rim_1A	RA: 01 36 44.5017 (24.1854238d) Dec: +15 46 33.97 (15.77610d) Equinox: J2000		
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Molecular gas]</i>				
(2)	phantom_rim_1B	RA: 01 36 44.4940 (24.1853917d) Dec: +15 46 30.95 (15.77526d) Equinox: J2000		
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Molecular gas]</i>				
(3)	phantom_rim_2	RA: 01 36 44.2865 (24.1845271d) Dec: +15 46 32.87 (15.77580d) Equinox: J2000		
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Molecular gas]</i>				
(4)	phantom_rim_3	RA: 01 36 44.1174 (24.1838225d) Dec: +15 46 30.09 (15.77503d) Equinox: J2000		
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Molecular gas]</i>				
(5)	phantom_rim_4	RA: 01 36 43.9887 (24.1832863d) Dec: +15 46 27.12 (15.77420d) Equinox: J2000		
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Molecular gas]</i>				
(6)	phantom_rim_5	RA: 01 36 43.9115 (24.1829646d) Dec: +15 46 24.13 (15.77337d) Equinox: J2000		
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Molecular gas]</i>				
(99)	phantom_rim_localBG	RA: 01 36 44.5213 (24.1855054d) Dec: +15 46 21.38 (15.77261d) Equinox: J2000		
<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Molecular gas]</i>				
(100)	Group Phantom_Void_Rim-A			
<i>Comments:</i> <i>Target Selection=[1 phantom_rim_1A, 2 phantom_rim_1B, 3 phantom_rim_2]</i>				
(101)	Group Phantom_Void_Rim-B			
<i>Comments:</i> <i>Target Selection=[4 phantom_rim_3, 5 phantom_rim_4]</i>				

Fixed Targets

Proposal 8564 - Targets - Staring at the Void: Supernova-Driven Star Formation and Supression in the Largest Local Superbubble

(102) Group Phantom\_Void\_Rim-C

*Comments:*

*Target Selection=[6 phantom\_rim 5, 99 phantom\_rim localBG]*

Proposal 8564 - Observation 1 - Staring at the Void: Supernova-Driven Star Formation and Supression in the Largest Local Superbub...

Wed Jun 18 23:00:17 GMT 2025

<b>Observation</b>	<p><b>Proposal 8564, Observation 1: A NIRSpec</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
	<p>(Visit 1:1) Warning (Form): Data Excess over lower threshold</p> <p>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>											
<b>Diagnosics</b>												
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>			<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>			
	(100)	Group Phantom_Void_Rim-A										
<p><i>Comments:</i>  <i>Target Selection=[1 phantom_rim_1A, 2 phantom_rim_1B, 3 phantom_rim_2]</i></p>												
<b>Template</b>	<b>TA Method</b>						<b>HFF Readout Mode</b>					
	NONE						false					
<b>Dithers</b>	<b>#</b>	<b>Dither Type</b>		<b>Size</b>	<b>Starting Point</b>			<b>Number of Points</b>	<b>Points</b>			
	1	4-POINT-DITHER										
<b>Spectral Elements</b>	<b>#</b>	<b>Grating/Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Leakcal</b>	<b>Dither</b>	<b>Autocal</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	G395M/F290LP	NRSIRS2RAPID	15	3	false	true	NONE	4	12	2801.067	224365
	2	G395M/F290LP	NRSIRS2RAPID	15	3	true	true	NONE	4	12	2801.067	224365

Proposal 8564 - Observation 2 - Staring at the Void: Supernova-Driven Star Formation and Supression in the Largest Local Superbub...

Wed Jun 18 23:00:17 GMT 2025

<b>Observation</b>	<b>Proposal 8564, Observation 2: A MIRI IFU</b> <b>Diagnostic Status: Warning</b> Observing Template: MIRI Medium Resolution Spectroscopy																																																																																																																																													
	(A MIRI IFU (Obs 2)) Warning (Form): Imager Filter overlap. (A MIRI IFU (Obs 2)) Warning (Form): Imager Filter overlap. (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.																																																																																																																																													
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Special Requirements

Group Observations 2, 4, 6, Non-interruptible

Proposal 8564 - Observation 3 - Staring at the Void: Supernova-Driven Star Formation and Supression in the Largest Local Superbub...

Wed Jun 18 23:00:17 GMT 2025

<b>Observation</b>	<p><b>Proposal 8564, Observation 3: B NIRSpec</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
	<p>(Visit 3:1) Warning (Form): Data Excess over lower threshold</p> <p>(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>											
<b>Diagnosics</b>												
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>			<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>			
	(101)	Group Phantom_Void_Rim-B										
<p><i>Comments:</i>  <i>Target Selection=[4 phantom_rim_3, 5 phantom_rim_4]</i></p>												
<b>Template</b>	<b>TA Method</b>					<b>HFF Readout Mode</b>						
	NONE					false						
<b>Dithers</b>	<b>#</b>	<b>Dither Type</b>		<b>Size</b>	<b>Starting Point</b>			<b>Number of Points</b>	<b>Points</b>			
	1	4-POINT-DITHER										
<b>Spectral Elements</b>	<b>#</b>	<b>Grating/Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Leakcal</b>	<b>Dither</b>	<b>Autocal</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	G395M/F290LP	NRSIRS2RAPID	15	3	false	true	NONE	4	12	2801.067	224365
	2	G395M/F290LP	NRSIRS2RAPID	15	3	true	true	NONE	4	12	2801.067	224365

Proposal 8564 - Observation 6 - Staring at the Void: Supernova-Driven Star Formation and Supression in the Largest Local Superbub...

Wed Jun 18 23:00:17 GMT 2025

<b>Observation</b>	<b>Proposal 8564, Observation 6: B MIRI IFU</b> <b>Diagnostic Status: Warning</b> Observing Template: MIRI Medium Resolution Spectroscopy																																																																																																																																													
	(B MIRI IFU (Obs 6)) Warning (Form): Imager Filter overlap. (B MIRI IFU (Obs 6)) Warning (Form): Imager Filter overlap. (Visit 6:1) Warning (Form): Data Excess over lower threshold (Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.																																																																																																																																													
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Special Requirements

Group Observations 2, 4, 6, Non-interruptible

Proposal 8564 - Observation 5 - Staring at the Void: Supernova-Driven Star Formation and Supression in the Largest Local Superbub...

Wed Jun 18 23:00:17 GMT 2025

<b>Observation</b>	<p><b>Proposal 8564, Observation 5: C NIRSpec</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRSpec IFU Spectroscopy</p> <p>Background Observations:[]</p>																																															
<b>Diagnostics</b>	<p>(Visit 5:1) Warning (Form): Data Excess over lower threshold</p> <p>(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>																																															
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Proposal 8564 - Observation 4 - Staring at the Void: Supernova-Driven Star Formation and Supression in the Largest Local Superbub...

Wed Jun 18 23:00:17 GMT 2025

<b>Observation</b>	<b>Proposal 8564, Observation 4: C MIRI IFU</b> <b>Diagnostic Status: Warning</b> Observing Template: MIRI Medium Resolution Spectroscopy Background Observations:[]																																																																																																																																													
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