



2957 - The search for Population III stars in low-metallicity $7 < z < 9.5$ galaxies

Cycle: 2, Proposal Category: GO

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JWST Proposal 2957 (Created: Monday, January 22, 2024 at 12:00:57 PM Eastern Standard Time) - Overview

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1		NIRSpec IFU Spectroscopy	(1) 8013
	2		NIRSpec IFU Spectroscopy	(2) 10058975
	3		NIRSpec IFU Spectroscopy	(3) RX2129-ID11022
	8		NIRSpec IFU Spectroscopy	(3) RX2129-ID11022
	4		NIRSpec IFU Spectroscopy	(4) RX2129-ID11027

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
	5		NIRSpec IFU Spectroscopy	(5) ABELL-Z7885
	6		NIRSpec IFU Spectroscopy	(6) SXDF-NB1006-2
	7		NIRSpec IFU Spectroscopy	(7) ID4590

ABSTRACT

The detection of Population III (PopIII) stars is one of the major observational challenges in modern astronomy that can uniquely be addressed with JWST. Motivated by theoretical predictions, we propose to search for PopIII stars in the vicinity of low-metallicity ($<5\% Z_{\text{solar}}$) galaxies at redshifts $z=7-9.5$. The primary galaxies have imaging from JWST and/or HST, and their integrated spectra have been taken with NIRSpec-MSA. Here we propose to map the surroundings of these galaxies with NIRSpec IFS. NIRSpec-IFS has the distinctive imaging-spectroscopic capabilities to disentangle the characteristic spectral features of PopIII stars close to the primary galaxies, in the wavelength range where PopIII features are predicted to be strongest.

OBSERVING DESCRIPTION

This program consists of NIRSpec-IFS PRISM ($R\sim 100$) observations of seven $7 < z < 9.5$ galaxies. The goal is to search for Population III signatures through rest-frame UV and optical lines, which are fully covered by the NIRSpec prism for our target galaxies.

Two galaxies are located within the GOODS-S deep fields, and five sources are located within the lensing clusters Abell, RXJ and SMACS.

PA constraints have been defined individually for each target, to avoid contamination of the spectra due to nearby sources leaking through the MSA in the relevant part of the NIRSpec-MSA footprint (lower third of Q3 and Q4). Issues related to MSA leakage are also minimised through our dither strategy (see below). Therefore we do not require a leakcal exposure.

No target acquisition is included since all galaxies are located in well-studied fields containing stars with good astrometry. Small inaccuracies in acquisition are unproblematic because of the $3'' \times 3''$ NIRSpec-IFS FoV.

We use a medium cycling pattern with 12-point (10-point) dithers for less (more) massive galaxies, and 20 groups per integration, for a total of 5 (4) hours exposure time per target. The medium cycling pattern provides a good compromise between an amplitude ($\sim 0.5''$) large enough to "jump" failed open microshutters and to deal with other sources of background, while keeping a large FoV ($\sim 2.5'' \times 2.5''$) with complete exposure time. This dither pattern also provides a good sub-pixel sampling.

No background exposures are required since each observations contains a large number of spaxels free from emission from the central source or neighbours. We will use spaxels within the IFS FoV free from line emission to perform a background subtraction.

Proposal 2957 - Targets - The search for Population III stars in low-metallicity $7 < z < 9.5$ galaxies

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	8013	RA: 03 32 39.4704 (53.1644600d) Dec: -27 48 7.85 (-27.80218d) Equinox: J2000		
<i>Comments:</i> Category=Galaxy Description=[High-redshift galaxies] Extended=YES				
(2)	10058975	RA: 03 32 26.9842 (53.1124342d) Dec: -27 46 28.59 (-27.77461d) Equinox: J2000		
<i>Comments:</i> Category=Galaxy Description=[High-redshift galaxies] Extended=YES				
(3)	RX2129-ID11022	RA: 21 29 36.0800 (322.4003333d) Dec: +00 04 56.53 (.08237d) Equinox: J2000		
<i>Comments:</i> Category=Galaxy Description=[High-redshift galaxies] Extended=YES				
(4)	RX2129-ID11027	RA: 21 29 41.1730 (322.4215542d) Dec: +00 05 30.07 (.09169d) Equinox: J2000		
<i>Comments:</i> Category=Galaxy Description=[High-redshift galaxies] Extended=YES				
(5)	ABELL-Z7885	RA: 00 14 23.0600 (3.5960833d) Dec: -30 23 8.90 (-30.38581d) Equinox: J2000		
<i>Comments:</i> Category=Galaxy Description=[High-redshift galaxies] Extended=YES				
(6)	SXDF-NB1006-2	RA: 02 18 56.5360 (34.7355667d) Dec: -05 19 58.87 (-5.33302d) Equinox: J2000		
<i>Comments:</i> Category=Galaxy Description=[High-redshift galaxies] Extended=YES				
(7)	ID4590	RA: 07 23 26.2392 (110.8593300d) Dec: -73 26 56.98 (-73.44916d) Equinox: J2000		
<i>Comments:</i> Category=Galaxy Description=[High-redshift galaxies] Extended=YES				

Fixed Targets

Proposal 2957 - Observation 1 - The search for Population III stars in low-metallicity $7 < z < 9.5$ galaxies

Mon Jan 22 17:00:57 GMT 2024

Observation	<p>Proposal 2957, Observation 1</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
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)	8013	RA: 03 32 39.4704 (53.1644600d) Dec: -27 48 7.85 (-27.80218d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[High-redshift galaxies]</i> <i>Extended=YES</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point			Number of Points	Points			
	1	CYCLING		MEDIUM	1			12				
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	PRISM/CLEAR	NRSIRS2	20	1	false	true	NONE	12	12	17681.735	147378.1
Special Requirements	<p>Aperture PA Range 25.97164917 to 33.97164917 Degrees (V3 247.0 to 255.0)</p> <p>Aperture PA Range 152.97164917 to 213.97164917 Degrees (V3 14.0 to 75.0)</p> <p>Aperture PA Range 288.97164917 to 313.97164917 Degrees (V3 150.0 to 175.0)</p>											

Proposal 2957 - Observation 2 - The search for Population III stars in low-metallicity $7 < z < 9.5$ galaxies

Mon Jan 22 17:00:57 GMT 2024

Observation	<p>Proposal 2957, Observation 2</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
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			
	(2)	10058975	RA: 03 32 26.9842 (53.1124342d) Dec: -27 46 28.59 (-27.77461d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[High-redshift galaxies]</i> <i>Extended=YES</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point			Number of Points	Points			
	1	CYCLING		MEDIUM	1			12				
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	PRISM/CLEAR	NRSIRS2	20	1	false	true	NONE	12	12	17681.735	147538.1
Special Requirements	<p>Aperture PA Range 63.97164917 to 88.97164917 Degrees (V3 285.0 to 310.0)</p> <p>Aperture PA Range 146.47164917 to 232.97164917 Degrees (V3 7.5 to 94.0)</p> <p>Aperture PA Range 299.97164917 to 8.97164917 Degrees (V3 161.0 to 230.0)</p>											

Proposal 2957 - Observation 3 - The search for Population III stars in low-metallicity $7 < z < 9.5$ galaxies

Mon Jan 22 17:00:57 GMT 2024

Observation	<p>Proposal 2957, Observation 3</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
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			
	(3)	RX2129-ID11022	RA: 21 29 36.0800 (322.4003333d) Dec: +00 04 56.53 (.08237d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[High-redshift galaxies]</i> <i>Extended=YES</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point		Number of Points	Points				
	1	CYCLING		MEDIUM	1		12					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	PRISM/CLEAR	NRSIRS2	20	1	false	true	NONE	12	12	17681.735	147540.1
Special Requirements	<p>Aperture PA Range 33.97164917 to 58.97164917 Degrees (V3 255.0 to 280.0)</p> <p>Aperture PA Range 154.97164917 to 205.97164917 Degrees (V3 16.0 to 67.0)</p> <p>Aperture PA Range 298.97164917 to 304.97164917 Degrees (V3 160.0 to 166.0)</p>											

Proposal 2957 - Observation 8 - The search for Population III stars in low-metallicity $7 < z < 9.5$ galaxies

Mon Jan 22 17:00:57 GMT 2024

Observation	<p>Proposal 2957, Observation 8</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
Diagnostics	<p>(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 8:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.</p>											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(3)	RX2129-ID11022	RA: 21 29 36.0800 (322.4003333d) Dec: +00 04 56.53 (.08237d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[High-redshift galaxies]</i> <i>Extended=YES</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point			Number of Points	Points			
	1	CYCLING		MEDIUM	1			12				
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	PRISM/CLEAR	NRSIRS2	20	1	false	true	NONE	12	12	17681.735	147540.1
Special Requirements	<p>Aperture PA Range 33.97164917 to 58.97164917 Degrees (V3 255.0 to 280.0)</p> <p>Aperture PA Range 150.97164917 to 163.97164917 Degrees (V3 12.0 to 25.0)</p> <p>Aperture PA Range 278.97164917 to 304.97164917 Degrees (V3 140.0 to 166.0)</p>											

Proposal 2957 - Observation 4 - The search for Population III stars in low-metallicity $7 < z < 9.5$ galaxies

Mon Jan 22 17:00:57 GMT 2024

Observation	<p>Proposal 2957, Observation 4</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
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			
	(4)	RX2129-ID11027	RA: 21 29 41.1730 (322.4215542d) Dec: +00 05 30.07 (.09169d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[High-redshift galaxies]</i> <i>Extended=YES</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point		Number of Points	Points				
	1	CYCLING		MEDIUM	1		12					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	PRISM/CLEAR	NRSIRS2	20	1	false	true	NONE	12	12	17681.735	143637.1
Special Requirements	<p>Aperture PA Range 98.97164917 to 213.97164917 Degrees (V3 320.0 to 75.0)</p> <p>Aperture PA Range 303.97164917 to 348.97164917 Degrees (V3 165.0 to 210.0)</p>											

Proposal 2957 - Observation 5 - The search for Population III stars in low-metallicity $7 < z < 9.5$ galaxies

Mon Jan 22 17:00:57 GMT 2024

Observation	<p>Proposal 2957, Observation 5</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
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			
	(5)	ABELL-Z7885	RA: 00 14 23.0600 (3.5960833d) Dec: -30 23 8.90 (-30.38581d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[High-redshift galaxies]</i> <i>Extended=YES</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point			Number of Points	Points			
	1	CYCLING		MEDIUM	1			12				
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	PRISM/CLEAR	NRSIRS2	20	1	false	true	NONE	12	12	17681.735	147542.1
Special Requirements	<p>Aperture PA Range 54.97164917 to 84.97164917 Degrees (V3 276.0 to 306.0)</p> <p>Aperture PA Range 167.47164917 to 182.97164917 Degrees (V3 28.5 to 44.0)</p>											

Proposal 2957 - Observation 6 - The search for Population III stars in low-metallicity $7 < z < 9.5$ galaxies

Mon Jan 22 17:00:57 GMT 2024

Observation	<p>Proposal 2957, Observation 6</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
Diagnostics	(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(6)	SXDF-NB1006-2	RA: 02 18 56.5360 (34.7355667d) Dec: -05 19 58.87 (-5.33302d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[High-redshift galaxies]</i> <i>Extended=YES</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point		Number of Points	Points				
	1	CYCLING		MEDIUM	1		10					
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	PRISM/CLEAR	NRSIRS2	20	1	false	true	NONE	10	10	14734.779	147385.1
Special Requirements	<p>Aperture PA Range 140.27164917 to 228.97164917 Degrees (V3 1.3 to 90.0)</p> <p>Aperture PA Range 298.97164917 to 70.97164917 Degrees (V3 160.0 to 292.0)</p>											

Proposal 2957 - Observation 7 - The search for Population III stars in low-metallicity $7 < z < 9.5$ galaxies

Mon Jan 22 17:00:57 GMT 2024

Observation	<p>Proposal 2957, Observation 7</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
Diagnostics	(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(7)	ID4590	RA: 07 23 26.2392 (110.8593300d) Dec: -73 26 56.98 (-73.44916d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[High-redshift galaxies]</i> <i>Extended=YES</i></p>											
Template	TA Method											
	NONE											
Dithers	#	Dither Type		Size	Starting Point		Number of Points	Points				
	1	CYCLING		MEDIUM	1		12					
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	PRISM/CLEAR	NRSIRS2	20	1	false	true	NONE	12	12	17681.735	147543.1
Special Requirements	<p>Aperture PA Range 9.27164917 to 27.47164917 Degrees (V3 230.3 to 248.5)</p> <p>Aperture PA Range 172.57164917 to 224.07164917 Degrees (V3 33.6 to 85.1)</p>											