



3533 - A JWST high-definition view of an extremely metal-poor interstellar medium

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
IZw18 MRS				
	3	IZw18 MRS N	MIRI Medium Resolution Spectroscopy	(8) IZW18N
	4	IZw18 MRS S	MIRI Medium Resolution Spectroscopy	(7) IZW18S
	2	IZw18 MRS-BCK	MIRI Medium Resolution Spectroscopy	(5) IZW18-BCK

ABSTRACT

JWST has only just begun the quest to understand star formation in the metal-poor, low-mass dwarf galaxy population around the Epoch of Reionization and beyond. However, spatially-resolved studies will remain elusive. The most extreme blue compact dwarf galaxies (BCDs) in the Local Universe have properties that are reminiscent of this high- z dwarf population, and could provide a detailed answer to the question of how stars form in a low-metallicity environment. Here we propose MIRI/MRS spectroscopy of the most extreme BCD, I Zw 18, at a distance of 18.2 Mpc. Its extremely low metal abundance (2-3% solar), and its high specific star-formation rate ($sSFR = 10^{-7} - 10^{-8}/\text{yr}$) powered by two massive star clusters, make it the best approximation we have for star formation in the nearly pristine interstellar medium (ISM) at early epochs. Our observations are designed to map at 25-50 pc resolution the constituents of the ISM in this well-studied iconic target. We will analyze the warm H₂ properties through spatially-resolved H₂ excitation diagrams; identify PAH features around the HII regions driven by the two massive star clusters; and finally assess the hardness of the interstellar radiation field through fine-structure lines. Only JWST can provide the ultimate characterization of the structure of the ISM in extreme low-metallicity environments, and shed light on the local star-formation processes that govern galaxy formation and evolution in the early Universe.

OBSERVING DESCRIPTION

We will observe I Zw 18 with MIRI MRS and MIRI imaging (in parallel).

We will acquire complete MIRI MRS coverage (A, B, C) to map the warm molecular and ionized gas as well as dust, measure the hardness + intensity of the ISRF, and provide a comprehensive view of the ISM on scales of ~ 25 -50 pc in this galaxy. Two pointings are necessary to cover the central parts of I Zw 18. We have used the SLOWR1 readout, 4-point dither pattern with Ngrp = (40, 40, 35) so as not to exceed the 1000s maximum recommended integration length.

MIRI imaging (simultaneously with MIRI MRS background) will be acquired in the three filters F560W, F1130W, and F2550W, none of which are already acquired in GTO. These observations will allow to map warm dust at additional wavelengths. These observations, with FASTR1 readout, will also have a 4-point dither pattern with Ngrp = (80, 50, 40), respectively, for the three filters, and 1 integration for F2550W, and 2 for the remaining filters.

We will request a specific PA in order to map I Zw 18 with MIRI MRS and simultaneously acquire MIRI Imaging during the MIRI MRS background acquisitions. For I Zw 18 we have selected the orientation angle range of PA = 135-145 degrees, as this is in the permitted schedulable range.

Proposal 3533 - Targets - A JWST high-definition view of an extremely metal-poor interstellar medium

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous	
	(5)	IZW18-BCK	RA: 09 34 9.7113 (143.5404637d) Dec: +55 14 13.06 (55.23696d) Equinox: J2000			
	<i>Comments:</i> <i>Category=ISM</i> <i>Description=[Gaseous nebulae, H II regions, Interstellar dust, Interstellar molecules, Warm ionized medium]</i>					
	(7)	IZW18S	RA: 09 34 2.2876 (143.5095317d) Dec: +55 14 23.53 (55.23987d) Equinox: J2000			
<i>Comments:</i> <i>Category=Stellar Cluster</i> <i>Description=[O clusters, Young star clusters]</i>						
(8)	IZW18N	RA: 09 34 1.9939 (143.5083079d) Dec: +55 14 27.31 (55.24092d) Equinox: J2000				
<i>Comments:</i> <i>Category=Stellar Cluster</i> <i>Description=[O clusters, Young star clusters]</i>						

Proposal 3533 - Observation 3 - A JWST high-definition view of an extremely metal-poor interstellar medium

Wed Aug 21 17:00:11 GMT 2024

Observation	Proposal 3533, Observation 3: IZw18 MRS N Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy												
	(IZw18 MRS N (Obs 3)) Warning (Form): Imager Filter overlap. (Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.												
Fixed Targets	#	Name	Target Coordinates				Targ. Coord. Corrections			Miscellaneous			
	(8)	IZW18N	RA: 09 34 1.9939 (143.5083079d) Dec: +55 14 27.31 (55.24092d) Equinox: J2000 <i>Comments:</i> Category=Stellar Cluster Description=[O clusters, Young star clusters]										
Acquisition	#	Target											
	1	NONE											
Template	AcqFilter	Primary Channel			Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
		All MRS			YES			FULL		NEUTRAL			
Dithers	#	Dither Type				Optimized For				Direction			
	1	4-Point				EXTENDED SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1		IMAGER	F2550W	FASTR1	40	2	1	Dither 1	4	8	899.113	143795
	1	LONG(C)	MRSLONG		SLOWR1	35	4	1	Dither 1	4	16	13665.034	143795
	1	LONG(C)	MRSSHORT		SLOWR1	35	4	1	Dither 1	4	16	13665.034	143795
	2		IMAGER	F1130W	FASTR1	50	2	1	Dither 1	4	8	1121.116	143795
	2	MEDIUM(B)	MRSLONG		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795
	2	MEDIUM(B)	MRSSHORT		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795
	3		IMAGER	F560W	FASTR1	80	4	1	Dither 1	4	16	3585.352	143795
	3	SHORT(A)	MRSLONG		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795
	3	SHORT(A)	MRSSHORT		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795

Proposal 3533 - Observation 3 - A JWST high-definition view of an extremely metal-poor interstellar medium

Special Requirements

Aperture PA Range 135 to 145 Degrees (V3 135.0 to 145.0)

Sequence Observations 2, 3, 4, Non-interruptible

Proposal 3533 - Observation 4 - A JWST high-definition view of an extremely metal-poor interstellar medium

Wed Aug 21 17:00:11 GMT 2024

Observation	Proposal 3533, Observation 4: IZw18 MRS S Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy												
	(IZw18 MRS S (Obs 4)) Warning (Form): Imager Filter overlap. (Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.												
Diagnosics													
Fixed Targets	#	Name	Target Coordinates				Targ. Coord. Corrections			Miscellaneous			
	(7)	IZW18S	RA: 09 34 2.2876 (143.5095317d) Dec: +55 14 23.53 (55.23987d) Equinox: J2000										
Comments: Category=Stellar Cluster Description=[O clusters, Young star clusters]													
Acquisition	#	Target											
	1	NONE											
Template	AcqFilter	Primary Channel			Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
		All MRS			YES			FULL		NEUTRAL			
Dithers	#	Dither Type				Optimized For				Direction			
	1	4-Point				EXTENDED SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1		IMAGER	F2550W	FASTR1	40	2	1	Dither 1	4	8	899.113	143795
	1	LONG(C)	MRSLONG		SLOWR1	35	4	1	Dither 1	4	16	13665.034	143795
	1	LONG(C)	MRSSHORT		SLOWR1	35	4	1	Dither 1	4	16	13665.034	143795
	2		IMAGER	F1130W	FASTR1	50	2	1	Dither 1	4	8	1121.116	143795
	2	MEDIUM(B)	MRSLONG		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795
	2	MEDIUM(B)	MRSSHORT		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795
	3		IMAGER	F560W	FASTR1	80	4	1	Dither 1	4	16	3585.352	143795
	3	SHORT(A)	MRSLONG		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795
	3	SHORT(A)	MRSSHORT		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795

Proposal 3533 - Observation 4 - A JWST high-definition view of an extremely metal-poor interstellar medium

Special Requirements

Aperture PA Range 135 to 145 Degrees (V3 135.0 to 145.0)

Sequence Observations 2, 3, 4, Non-interruptible

Proposal 3533 - Observation 2 - A JWST high-definition view of an extremely metal-poor interstellar medium

Wed Aug 21 17:00:11 GMT 2024

Observation	Proposal 3533, Observation 2: IZw18 MRS-BCK Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy <i>Comments: Dedicated MRS background observation.</i>												
	(IZw18 MRS-BCK (Obs 2)) Warning (Form): Imager Filter overlap. (Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.												
Diagnosics													
Fixed Targets	#	Name	Target Coordinates				Targ. Coord. Corrections			Miscellaneous			
	(5)	IZW18-BCK	RA: 09 34 9.7113 (143.5404637d) Dec: +55 14 13.06 (55.23696d) Equinox: J2000										
<i>Comments:</i> Category= <i>ISM</i> Description= <i>[Gaseous nebulae, H II regions, Interstellar dust, Interstellar molecules, Warm ionized medium]</i>													
Acquisition	#											Target	
	1											NONE	
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray		Grating Wheel Direction		
		All MRS				YES			FULL		NEUTRAL		
Dithers	#	Dither Type				Optimized For				Direction			
	1	4-Point				EXTENDED SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1		IMAGER	F2550W	FASTR1	40	2	1	Dither 1	4	8	899.113	143795
	1	LONG(C)	MRSLONG		SLOWR1	35	4	1	Dither 1	4	16	13665.034	143795
	1	LONG(C)	MRSSHORT		SLOWR1	35	4	1	Dither 1	4	16	13665.034	143795
	2		IMAGER	F1130W	FASTR1	50	2	1	Dither 1	4	8	1121.116	143795
	2	MEDIUM(B)	MRSLONG		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795
	2	MEDIUM(B)	MRSSHORT		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795
	3		IMAGER	F560W	FASTR1	80	4	1	Dither 1	4	16	3585.352	143795
	3	SHORT(A)	MRSLONG		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795
	3	SHORT(A)	MRSSHORT		SLOWR1	40	2	1	Dither 1	4	8	7740.334	143795

Proposal 3533 - Observation 2 - A JWST high-definition view of an extremely metal-poor interstellar medium

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