

1349 - Establishing Extreme Dynamic Range with JWST: Decoding Smoke Signals in the Glare of a Wolf-Rayet Binary

Cycle: 1, Proposal Category: ERS

INVESTIGATORS

Name	Institution	E-Mail
Dr. Ryan M Lau (PI)	ISAS, Japan Aerospace Exploration Agency	ryanlau@ir.isas.jaxa.jp
Dr. Mansi Kasliwal (CoI) (US Admin CoI)	California Institute of Technology	mansi@astro.caltech.edu
Dr. Anand Sivaramakrishnan (CoI)	Space Telescope Science Institute	anand@stsci.edu
Dr. Matthew J Hankins (CoI)	Arkansas Tech University	mjhankins44@gmail.com
Deepashri Thatte (CoI)	Space Telescope Science Institute	thatte@stsci.edu
Dr. Joel Sanchez-Bermudez (CoI) (ESA Member)	European Southern Observatory - Chile	sanchezj@eso.org
Dr. Astrid Lamberts (CoI) (ESA Member)	Observatoire de la Cote d'Azur	astrid.lamberts@oca.eu
Dr. Christopher Michael Post Russell (CoI)	Catholic University of America	crussell@udel.edu

OBSERVATIONS

Folder	Observation	Label	Observing Template	Science Target		
WR 140) - MRS		-	_		
	1	WR 140 Offset 1	MIRI Medium Resolution Spectroscopy	(2) WR140-OFFSET-1		
	10	WR 140 Offset 2	MIRI Medium Resolution Spectroscopy	(3) WR140-OFFSET-2		
	2	WR 140 MRS CAL	MIRI Medium Resolution Spectroscopy	(4) WR140MRSCAL		
WR 140) - MIRI Imager					
	8	WR 140 - MIRI Imager	MIRI Imaging	(1) WR140		
WR 137	7 - AMI					
	3	WR 137 AMI Dither	NIRISS Aperture Masking Interferometry	(5) WR137		
	4	WR 137 AMI PSF REF Dither	NIRISS Aperture Masking Interferometry	(6) WR137AMIREFPSF		

JWST Proposal 1349 (Created: Monday, May 24, 2021 at 6:42:48 AM Eastern Standard Time) - Overview

Folder	Observation	Label	Observing Template	Science Target
	5	WR 137 AMI PSF REF	NIRISS Aperture Masking Interferometry	(6) WR137AMIREFPSF
		Stare	,	
	6	WR 137 AMI Stare	NIRISS Aperture Masking Interferometry	(5) WR137

ABSTRACT

Dust is a key ingredient in the formation of stars and planets. However, the dominant channels of dust production throughout cosmic time are still unclear. With its unprecedented sensitivity and spatial resolution in the mid-IR, the James Webb Space Telescope (JWST) is the ideal platform to address this issue by investigating the dust abundance, composition, and production rates of various dusty sources. In particular, colliding-wind Wolf-Rayet (WR) binaries are efficient dust producers in the local Universe, and likely existed in the earliest galaxies. We purpose JWST observations of the colliding-wind binaries WR 140 and WR 137 to investigate dust composition, abundance, and formation mechanisms in this dust-forming colliding-wind process. We will utilize three key JWST observing modes with the medium-resolution spectrometer (MRS) and imager on the Mid-Infrared Instrument (MIRI) and the Aperture Masking Interferometry (AMI) mode with the Near Infrared Imager and Slitless Spectrograph (NIRISS).

Our proposed observations will yield high impact scientific results on the dust forming properties WR binaries, and establish a benchmark for key observing modes for imaging bright sources with faint extended emission. This will be valuable in various astrophysical contexts including mass-loss from evolved stars, dusty tori around active galactic nuclei, and protoplanetary disks. We are committed to designing and delivering science-enabling products for the JWST community that address technical issues such as bright source artifacts that will limit the maximum achievable image contrast.

(NoI Ref. #180)

OBSERVING DESCRIPTION

We will perform a total of 15.9 hours of MIRI MRS and Imager observations of the dust-forming Wolf-Rayet (WR) binary WR 140 and NIRISS/AMI observations of the dust-forming WR binary WR 137. These observations include two calibrators for each instrument mode: HD 193090 and HD 228337.

In the MIRI MRS mode, we will obtain the full 5 - 28 micron spectral coverage (Ch1 - Ch4) of WR 140 out to 3 fossil dust arcs. We will perform MRS observations at two pointings: one offset from WR 140 by 0.4 arcseconds, and one offset by 2.7 arcseconds to cover the bright regions in the 1st, 2nd, and 3rd fossil dust arcs. Both MRS pointings will utlize the 4-point dither pattern optimzed for extended sources.

JWST Proposal 1349 (Created: Monday, May 24, 2021 at 6:42:48 AM Eastern Standard Time) - Overview

We will observe a mid-IR PSF reference star selected from the JMMC stellar diameter catalog (Bourges et al. 2017) with a nearly identical 12 micron flux as WR 140. Comparing the spectra from the reference star and WR 140 will allow us to differentiate the artifacts and the bright source from faint extended emission around WR 140. Importantly, HD 193090 is located within 2 degrees of WR 140, which requires only a ~5 min JWST slew overhead. We will perform the same dither pattern as our central WR 140 pointing but with a shorter exposure time per dither position.

In the MIRI Imager mode, we will perform short, several minute-long exposures with the F1500W, F2100W, and F2550W filters centered on WR 140 using the 4-point dither strategy optimized for extended sources. Although the bright central source of WR 140 and possibly the 1st and 2nd dust arcs will saturate the Imager, we will be able to probe out to 7 or more fossil dust arcs with the Imager sensitivity and field of view in the "FULL" subarray mode.

In the NIRISS/AMI mode, we propose F380M and F480M observations of WR 137 in a 4-point dither and undithered mode. At the anticipated timing of Cycle 1 ERS, WR 137 will be exhibiting enhanced dust-formation due to the orbital confirguration of the central binary system and thus provides an ideal target for NIRISS/AMI to achieve our science and technical goals. The goal of performing the two different observations will be to investigate and attempt to mitigate the NIRISS/AMI persistence effects from bright sources. We will perform dithered and undithered ("stare" mode) with the same on-source exposure time. Both modes have advantages and disadvantages for imaging the faint emission around WR 137. With no dithers, WR 137 will remain in the same position on the detector and persistence will therefore not significantly affect the resulting data. However, bad pixels on the detector cannot be corrected. The 4-point primary dither mode will allow us to remove the bad pixels but persistent images from the bright central source of WR 137 will affect the image reconstruction. One of our goals in this proposal is to determine which method is best suited for performing observations of faint extended emission around bright sources. Additionally, we will investigate how to calibrate for the persistence in the dithered observations. After the last "stare" observation, we will take two short exposure direct images with the F380M and F480M filters.

We will observe a PSF calibrator of similar 3.8 and 4.8 micron flux as the bright central core of WR 137 with NIRISS/AMI in order to characterize the interferometric transfer function and ultimately for the reconstruction of WR 137. Our PSF calibrator, HD 228337, will be observed in the same dither and no-dither observations that we plan for WR 137 with the same exposure depth to compare the persistence effects.

Proposal 1349 - Targets - Establishing Extreme Dynamic Range with JWST: Decoding Smoke Signals in the Glare of a Wolf-Rayet Bi...

	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous						
(1)	WR140	RA: 20 20 27.9761 (305.1165671d)	7							
		Dec: +43 51 16.28 (43.85452d)								
		Equinox: J2000								
		y the target selector and retrieved from the SIMBAD databas	e.							
Desc	egory=Star cription=[WC stars] ended=YES									
(2)	WR140-OFFSET-1	RA: 20 20 27.9851 (305.1166046d)								
		Dec: +43 51 15.90 (43.85442d)								
		Equinox: J2000								
Cate Desc	nments: 1st offset pointing egory=Star cription=[WC stars] ended=YES									
(3)	WR140-OFFSET-2	RA: 20 20 28.0553 (305.1168971d)								
		Dec: +43 51 13.74 (43.85382d)								
		Equinox: J2000								
Com	nments: 2nd offset pointing									
Desc	egory=Star scription=[WC stars]									
Exte	ended=YES									
Category=Star										
e l		Dec: +45 20 20.87 (45.33913d)								
		Equinox: J2000								
K5II Cate	nments: MIRI MRS PSF calibrator fo III Star (W3 = 3.454 mag) egory=Calibration ecription=[Point spread function] ended=NO	or WR140								
(5)	WR137	RA: 20 14 31.7632 (303.6323467d)	Proper Motion RA: -2.2621618417001282	E-4 sec of						
		Dec: +36 39 39.51 (36.66098d)	time/yr Proper Motion Dec: -0.0056630000017321	AA oronodur						
		Equinox: J2000	Epoch of Position: 2015.5	144 alcsec/yl						
Cate	nments: This object was generated b egory=Star ccription=[WC stars] ended=YES	y the targetselector and retrieved from the SIMBAD database	•							
(6)	WR137AMIREFPSF	RA: 20 12 57.8919 (303.2412162d) Dec: +35 45 46.45 (35.76290d)	Proper Motion RA: -5.562111937378841E time/yr	3-5 sec of						
		Equinox: J2000	Proper Motion Dec: -0.0041010000131791	146 arcsec/yr						
		Equiliox: J2000	Epoch of Position: 2015.5	•						
0.95 Cate	nments: W1 = 5.290, W2 = 5.223 52 Degrees from WR137 egory=Calibration scription=[Point spread function]		•							

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<u>ا</u>	_	, Observation 1	: WR 140 Offse	t 1								Mon May 24 1	1:42:48 GMT 2021
l≝	Diagnostic Sta	atus: Warning											
Observation	Observing Tem	nplate: MIRI Me	dium Resolution	Spectroscopy									
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Diagnostics	(WR 140 Offse	et 1 (Obs 1)) War	rning (Form): Im	ager Filter over	lap.								
	#	Name	,	Target Coordin	nates		Targ. (oord. Correction	s	M	iscellaneous		
Targets		WR140-OFFSE			351 (305.1166046	5d)	Turgite	oora, correction	5	.,,	Beenaneous		
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Га				Equinox: J2000	70 (43.0344 2 0)								
ğ.	Comments: 1st	offset pointing		Equiliox. 32000									
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╽╙	Description=[\ Extended=YES	WC stars]											
_	#	Target		Filter	Readou	ıt Pattern	Groups/Int	Integration	s/Exn	Total Integrations	Total Expos	ure Time ETC	C Wkbk.Calc ID
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	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	t Integrations/l	E Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
Spectral Elements	1	1	IMAGER	F560W	FAST	15	19	1	Dither 1	4	76	3163.546	
ne	1	SHORT(A)	MRSLONG		FAST	15	19	1	Dither 1	4	76	3163.546	
<u>le</u>	1	SHORT(A)	MRSSHORT		FAST	15	19	1	Dither 1	4	76	3163.546	
	2		IMAGER	F1000W	FAST	15	19	1	Dither 1	4	76	3163.546	
tra	2	MEDIUM(B)	MRSLONG		FAST	15	19	1	Dither 1	4	76	3163.546	
ec	2	MEDIUM(B)	MRSSHORT		FAST	15	19	1	Dither 1	4	76	3163.546	
o.	3	,	IMAGER	F2100W	FAST	15	19	1	Dither 1	4	76	3163.546	
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S	3	LONG(C)	MRSLONG		FAST	15	19	1	Dither 1	4	76	3163.546	

<u>Pro</u>	pposal 1349 - Observation 1 - Establishing Extreme Dynamic Range with JWST: Decoding Smoke Signals in the Glare of a Wolf-Ra
Requirements	Sequence Observations 1, 10, Non-interruptible Same Aperture PA 1, 2
Special	

<u>Pro</u>	posal 134	<u> 9 - Obser</u>	vation 10	- Establis	hing Extre	me Dynami	c Range v	vith JWST:	Decodin	g Smoke Si	gnals in th	<u>ie Glare o</u>	f a Wolf-R
n	Proposal 1349	Observation 1	0: WR 140 Offs	set 2								Mon May 24 1	1:42:48 GMT 2021
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Observation	Observing Tem	plate: MIRI Med	dium Resolution	Spectroscopy									
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Diagnostics	(WR 140 Offse	t 2 (Obs 10)) Wa	arning (Form): I	mager Filter ove	erlap.								
	#	Name		Target Coordi	nates		Targ. C	oord. Correction	ıs	M	iscellaneous		
¥		WR140-OFFSE			553 (305.116897	1d)	<u> </u>						
Targets					.74 (43.85382d)	,							
] <u>e</u>				Equinox: J2000									
Fixed	Comments: 2nd	l offset pointing											
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l ts	1		IMAGER	F560W	FAST	15	19	1	Dither 1	4	76	3163.546	
a B	1	SHORT(A)	MRSLONG		FAST	15	19	1	Dither 1	4	76	3163.546	
Spectral Elements	1	SHORT(A)	MRSSHORT		FAST	15	19	1	Dither 1	4	76	3163.546	
 	2		IMAGER	F1000W	FAST	15	19	1	Dither 1	4	76	3163.546	
<u>#</u>	2	MEDIUM(B)	MRSLONG		FAST	15	19	1	Dither 1	4	76	3163.546	
l ğ	2	MEDIUM(B)	MRSSHORT		FAST	15	19	1	Dither 1	4	76	3163.546	
ΙΩ	3		IMAGER	F2100W	FAST	15	19	1	Dither 1	4	76	3163.546	
	3	LONG(C)	MRSLONG		FAST	15	19	1	Dither 1	4	76	3163.546	
	3	LONG(C)	MRSSHORT		FAST	15	19	1	Dither 1	4	76	3163.546	

<u>Pro</u>	oposai 134	<u> 19 - Observa</u>	<u>ation 10 -</u>	Establishing	<u>Extreme Dynar</u>	<u>nic Range with</u>	JWS1: Decoding	Smoke Sign	als in the Gi	<u>are of a wo</u>	<u> It-K</u>
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<u>Pro</u>	oposal 134	<u> 19 - Obser</u>	vation 2 -	Establish	ing Extren	ne Dynam	<u>ic Range w</u>	ith JWST: D	Decodin	<u>ıg Smoke Sig</u> ı	nals in the	Glare of	a Wolf-Ra
Ľ	Proposal 1349	, Observation 2	: WR 140 MRS	CAL								Mon May 24 1	1:42:48 GMT 2021
Iặ	Diagnostic Sta	tus: Warning											
۱	Observing Tem	nplate: MIRI Med	dium Resolution	Spectroscopy									
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Diagnostics	(WR 140 MRS	CAL (Obs 2)) V	Varning (Form):	Imager Filter o	verlap.								
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इं	(4)	WR140MRSCA	L	RA: 20 16 35.9	811 (304.149921	2d)							
Ιğ)			Dec: +45 20 20	.87 (45.33913d)								
Targets				Equinox: J2000	1								
Fixed	Comments: MI	RI MRS PSF cali	ibrator for WR1	40									
ڐؚ؞ٳ	K5III Star (W3 Category=Cali	= 3.454 mag) bration											
۱"	Description=[I Extended=NO	Point spread fund	ction]										
_		Target		Filter	Reado	ut Pattern	Groups/Int	Integration	ıs/Evn	Total Integrations	Total Expos	ure Time ET	C Wkbk.Calc ID
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ţ	Primary Chan	mel			Simult	aneous Imaging	g			Imager Subarray			
Template	ALL				YES		FULL						
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ırs	#			Dither T	Гуре		Optimized For Directi						
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۱.,		Range			Pattern		xp	h			Integrations	Exposure Time	Wkbk.Calc ID
Spectral Elements	1		IMAGER	F560W	FAST	15	3	1	Dither 1	4	12	499.507	
<u>ا</u>	1	SHORT(A)	MRSLONG		FAST	15	3	1	Dither 1	4	12	499.507	
<u>ē</u>	1	SHORT(A)	MRSSHORT		FAST	15	3	1	Dither 1	4	12	499.507	
12	2		IMAGER	F1000W	FAST	15	3	1	Dither 1	4	12	499.507	
itra	2	MEDIUM(B)	MRSLONG		FAST	15	3	1	Dither 1	4	12	499.507	
l š	2	MEDIUM(B)	MRSSHORT		FAST	15	3	1	Dither 1	4	12	499.507	
S	3		IMAGER	F2100W	FAST	15	3	1	Dither 1	4	12	499.507	
	2	LONG(C)	MRSLONG		FAST	15	3	1	Dither 1	4	12	499.507	
1	3	LONG(C)	MKSLONG		I'ASI	1.5	5	1	Dittier	4	12	499.307	

<u>Prc</u>	pposal 1349 - Observation 2 - Establishing Extreme Dynamic Hange with JWST: Decoding Smoke Signals in the Glare of a Wolf-Ha
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Proposal 1349 - Observation 8 - Establishing Extreme Dynamic Range with JWST: Decoding Smoke Signals in the Glare of a Wolf-Ra. Proposal 1349, Observation 8: WR 140 - MIRI Imager Mon May 24 11:42:48 GMT 2021 Observation Diagnostic Status: No Diagnostics Observing Template: MIRI Imaging Name **Target Coordinates** Targ. Coord. Corrections Miscellaneous **Fixed Targets** WR140 RA: 20 20 27.9761 (305.1165671d) Dec: +43 51 16.28 (43.85452d) Equinox: J2000 Comments: This object was generated by the target selector and retrieved from the SIMBAD database. Category=Star Description=[WC stars] Extended=YES **Template** Subarray FULL Spectral Elements Dithers Dither Type **Starting Point Number of Points Points Starting Set Number of Sets Optimized For** Pattern Size Direction 5 3 **EXTENDED** POSITIVE 4-Point-Sets DEFAULT SOURCE Filter Readout Pattern Groups/Int Integrations/Exp Exposures/Dith Dither **Total Dithers Total Exposure** ETC Wkbk.Calc Total Integrations Time ID F1500W 10 12 12 333.005 **FAST** 1 Dither 1 F2100W **FAST** 10 Dither 1 12 12 333.005 F2550W **FAST** 10 12 12 333.005 Dither 1

Pro	oposal 1349 - Observation	n 3 - Establishi	ng Extreme D	<u> Dynamic Ran</u>	ge with JW	ST: Decodin	g Smoke Sigi	nals in the Glare	e of a Wolf-Ra
	Proposal 1349, Observation 3: WR 13								y 24 11:42:48 GMT 202
Ĕ	Diagnostic Status: No Diagnostics								
2	Observing Template: NIRISS Aperture	Masking Interferometry							
se									
Observation									
Ť	# Name	Target Coordin	ates		Targ. Coord. Co	orrections	Mi	scellaneous	
ts	(5) WR137		32 (303.6323467d)			A: -2.262161841700	1282E-4 sec of		
Targets		Dec: +36 39 39.5	51 (36.66098d)		time/yr				
<u>ā</u> .		Equinox: J2000	,			ec: -0.005663000001	732144 arcsec/yr		
_		1			Epoch of Position	n: 2015.5			
Fixed	Comments: This object was generated by Category=Star Description=[WC stars]	y the targetselector and	retrieved from the SII	MBAD database.					
Acquisition	# Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/	Exp Total Integra	tions Total Exposure Time	ETC Wkbk.Calc
Sit	1 SAME	AMIBRIGHT	F480M	NISRAPID	5	1	1	0.321	50283.1
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	Subarray				Direct Image				
<u>a</u>	SUB80				false				
m	56266				Taise				
Template									
	#		Primary Dit	thers			Subpixel Positions		
þe	1		4				NONE		
Dithers									
	# Filter	Readout Patter	rn Groups/Int	Integrati	ons/Exp To	tal Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
en	1 F480M	NISRAPID	4	400	4		1600	636.288	50283
Ĕ	2 F380M	NISRAPID	2	680	4		2720	671.296	50283
ŏ									
ā									
Spectral Elements									
be									
ଊ									
es	WR 137 AMI PSF REF Dither (Obs 4) (PSF Reference; Filters [[F380M, F480M])						
Š	Additional Justification: false								
ē									
References									
ď									
PSF									
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<u>Pro</u>	oposal 1349 - Observation 3 - Establishing Extreme Dynamic Range with JWST: Decoding Smoke Signals in the Glare of a Wolf-Ra
Requirements	Sequence Observations 3, 4, Non-interruptible
Special F	

Observation	Proposal 1349, Observation 4 Diagnostic Status: No Diagno	Evation 4 - Establish I: WR 137 AMI PSF REF Dith Institute Institute Masking Interferometry	er	ymamic Ham	ge wiin e	WOT. Decodi	ing emoke eig		24 11:42:48 GMT 2021	
	# Name	Target Coordi	nates		Targ. Coord	. Corrections	M	iscellaneous		
Fixed Targets	(6) WR137AMIREFPSF RA: 20 12 57.8919 (303.2412162d) Dec: +35 45 46.45 (35.76290d) Equinox: J2000 Comments: W1 = 5.290, W2 = 5.223 0.952 Degrees from WR137 Category=Calibration			Proper Motion RA: -5.562111937378841E-5 sec of time/yr Proper Motion Dec: -0.004101000013179146 arcsec/yr Epoch of Position: 2015.5						
on	Description=[Point spread fun # Target	Acquisition Mode	Filter	Readout Pattern	Groups/In	t Integration	s/Exp Total Integra	ations Total Exposure Time	ETC Wkbk.Calc	
Acquisition	1 SAME	AMIBRIGHT	F480M	NISRAPID	5	1	1	0.321	50283.6	
	Subarray				Direct Ima	ge				
Template	SUB80				false					
rs	# Primary Dithers						Subpixel Positions			
Dithers	1		4				NONE			
ıts	# Filter	Readout Patte	ern Groups/Int	Integrati	ons/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
Jen	1 F480M	NISRAPID	8	225		4	900	629.496	50283	
Spectral Elements	2 F380M	1 NISRAPID	2	680		4	2720	671.296	50283	
PSF References	PSF Reference: true									

<u>Pro</u>	<u>roposal 1349 - Observation 4 - Establishing Extreme Dynamic Range with JWST: Decoding Smoke Signals in the Glare of a Wolf-R</u>	<u>а</u>
Requirements		
Special		

Observation	Proposal 1349 - Observation 5: Will Diagnostic Status: No Diagnostics Apert	R 137 AMI PSF REF Stare	g Extreme E	ymarmo maris	go wiiir	, , , , , , , , , , , , , , , , , , ,	oodaniq o	mono eigne		24 11:42:48 GMT 2021
	# Name	Target Coordinat	tes		Targ. Coor	l. Corrections	s	Misco	ellaneous	
Fixed Targets	(6) WR137AMIREFPSF RA: 20 12 57.8919 (303.2412162d) Dec: +35 45 46.45 (35.76290d) Equinox: J2000 Comments: W1 = 5.290, W2 = 5.223 0.952 Degrees from WR137 Category=Calibration			Proper Motion RA: -5.562111937378841E-5 sec of time/yr Proper Motion Dec: -0.004101000013179146 arcsec/yr Epoch of Position: 2015.5						
ion	Description= Point spread function # Target	Acquisition Mode	Filter	Readout Pattern	Groups/I	nt In	tegrations/Exp	Total Integratio	ns Total Exposure Time	ETC Wkbk.Calc ID
Acquisition	1 SAME	AMIBRIGHT I	F480M	NISRAPID	5	1		1	0.321	50283.6
ē	Subarray				Direct Im	age				
Template	SUB80				false					
ırs	# Primary Dithers						Subp	oixel Positions		
Dithers	1		NONE				NON	E		
ıts	# Filter	Readout Pattern	Groups/Int	Integrati	ons/Exp	Total Dithe	rs Total	l Integrations	Total Exposure Time	ETC Wkbk.Calc ID
ЭĒ	1 F480M	NISRAPID	8	900		1	900		629.496	50283
Spectral Elements	2 F380M	NISRAPID	2	2720		1	2720		671.296	50283
PSF References	PSF Reference: true									

<u>Pro</u>	oposal 1349 - Observation 5 - Establishing Extreme Dynamic Hange with JWS1: Decoding Smoke Signals in the Glare of a Wolf-Ra	
nts	Sequence Observations 5, 6, Non-interruptible	
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Pro	posal 1349 - Observation	<u> 6 - Establishing I</u>	Extreme D	ynamic Ran	ge with JW	/ST: Decodin	g Smoke Sigr	als in the Glare	e of a Wolf-Ra
	Proposal 1349, Observation 6: WR 137								24 11:42:48 GMT 2021
Iĕ	Diagnostic Status: No Diagnostics								
\(\frac{8}{2}\)	Observing Template: NIRISS Aperture N	Masking Interferometry							
Observation									
ō									
	# Name	Target Coordinates			Targ. Coord. C	orrections	Mis	scellaneous	
Targets	(5) WR137	RA: 20 14 31.7632 (30	03.6323467d)			A: -2.262161841700	1282E-4 sec of		
Į		Dec: +36 39 39.51 (36	6.66098d)		time/yr	Dec: -0.005663000001	722144 20000 0/20		
] <u>a</u>		Equinox: J2000			Epoch of Positio		/32144 arcsec/yr		
B	Comments: This object was generated by	the targetselector and retrie	ved from the SIM	RAD database	Epoch of Fositio	II. 2013.3			
Fixed	Category=Star	ine iai geiseiceioi ana reirie	vea from the SIM	Bib unubuse.					
	Description=[WC stars] Extended=YES								
Acquisition	# Target	Acquisition Mode Filto	er	Readout Pattern	Groups/Int	Integrations/	Exp Total Integrat	ions Total Exposure Time	ETC Wkbk.Calc ID
<u>is</u>	1 SAME	AMIBRIGHT F48	0 M	NISRAPID	5	1	1	0.321	50283.1
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Ι <u>Ĕ</u> Ι	1 F480M	NISRAPID	5	21	4		84	39.742	
ਰ ਹ	2 F380M	NISRAPID	2	40	4		160	39.488	
Direct Image									
_	# Filter	Readout Pattern	Groups/Int	Integrati	ions/Evn To	otal Dithers	Total Integrations	Total Exposure Time	ETC Wkbk Cole ID
ΙË	1 F480M	NISRAPID	4	1600	1	nai Dimers	1600	636.288	50283
١Ĕ	2 F380M	NISRAPID	2	2720	1		2720	671.296	50283
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Spectral Elements									
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<u>Pr</u>	oposal 1349 - Observation 6 - Establishing Extreme Dynamic Range with JWST: Decoding Smoke Signals in the Glare of a Wolf-Ra
ď	WR 137 AMI PSF REF Stare (Obs 5) (PSF Reference; Filters [F380M, F480M])
	Additional Justification: false
References	
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