

1741 - Solid-state water inside the snowline in planet-forming disks: exploring the origin of water on terrestrial planets

Cycle: 1, Proposal Category: GO

INVESTIGATORS

Name	Institution
Dr. Alexey Potapov (PI) (ESA Member)	Max Planck Institute for Astronomy
Prof. Thomas K. Henning (CoI) (ESA Member)	Max Planck Institute for Astronomy
Dr. Jeroen Bouwman (CoI) (ESA Member) (CoPI)	Max Planck Institute for Astronomy
Dr. Hendrik Linz (CoI) (ESA Member)	Max Planck Institute for Astronomy
Dr. Henrik Beuther (CoI) (ESA Member)	Max Planck Institute for Astronomy
Prof. Sebastian Wolf (CoI) (ESA Member)	Universitat Kiel
Dr. Hiroshi Terada (CoI)	National Astronomical Observatory of Japan (NAOJ)

OBSERVATIONS

Folder	Observation	Label	Observing Template	Science Target
Observa	ation Folder			
	1		NIRSpec IFU Spectroscopy	(1) S216-0939
	3		MIRI Medium Resolution Spectroscopy	(1) S216-0939
	4		NIRSpec IFU Spectroscopy	(2) 132-1832
	5		MIRI Medium Resolution Spectroscopy	(2) 132-1832
	6	Copy of Observation 1	NIRSpec IFU Spectroscopy	(1) S216-0939
	7	Copy of Observation 4	NIRSpec IFU Spectroscopy	(2) 132-1832

ABSTRACT

The importance of water in our everyday life as well as in biochemical processes on Earth is undeniable. Water is also one of the main molecular species in different astrophysical environments, such as prestellar cores, protostellar envelopes, planet-forming disks, and planetary atmospheres, and

JWST Proposal 1741 (Created: Friday, September 22, 2023 at 7:00:32 PM Eastern Standard Time) - Overview

it is evidently required for the formation of life as we know it. Understanding the role of water in planet formation and the chemistry of protoplanetary disks and its delivery to rocky planets is a key requirement to understand the atmospheric composition of planets and the origins of life on Earth and, potentially, extrasolar planets.

The main goal of our proposal is to understand if water can be present in the solid state inside the snowline in planet-forming disks. Very recent laboratory experiments indicate that water ice can be trapped as part of a silicate/ice compound and thus survive in solid form beyond the sublimation temperature. A detection of trapped water and an estimation of its abundance will reinforce the wet scenario of the origin of water on Earth and terrestrial planets. A detection of silicate spectral bands will allow us to determine the silicate/trapped water mass ratio and to estimate the possible amount of water in building blocks of the planets.

An associated goal of the proposal is to search for minor bands of complex organic molecules and organic compounds to reveal the chemical complexity of planet-forming disks. These complex species may be present together with trapped water in building blocks of rocky planets inside the snowline. Their detection will critically advance our understanding of the origin of prebiotic molecules and life on Earth.

OBSERVING DESCRIPTION

This proposal aims at observing 2 edge-on protoplanetary disks in Orion (S216-0939 and 132-1832) with the IFUs of NIRSPEC and MIRI. The NIRSPEC observations use the medium resolution settings G235M/F170LP and G395M/F290LP to cover the 2 to 5 micron wavelength range, and especially to seamlessly cover the full extent of the water ice feature between 2.7 and 3.5 micron. As the targets are expected to be slightly extended at the shortest wavelengths of NIRSPEC we use a 4-point dither. Given the IFU size we apply a target acquisition for the NIRSPEC observations on 2 nearby stars to make sure our targets are properly centered on the image slicer. We use nearby stars with good-quality GAIA information for the TA as the target itself is moderately extended. As the IFU size of MIRI is large enough, no TA is needed. The MIRI/MRS observations are done for all 3 grating settings so the entire wavelength range between 5 and 28 mircrons is continuously covered. In the MIRI range we are especially interested in the silicate absorption features at 10 and 18 microns, as well as several faint absorption signals of complex organic molecule ices, mainly in the 5-10 micron range. For the MIRI observations we apply a 4 point dither, to get a proper spatial and wavelength sampling. At the longer wavelengths the sources are expected to be compact, meaning the background can be estimated from the observations itself and no additional off-pointing is required.

	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	S216-0939	RA: 05 35 21.5763 (83.8399012d) Dec: -05 09 38 84 (-5 16079d)	Proper Motion RA: 3.306738217859502E-5 sec of time/yr	
			Equinox: J2000	Proper Motion Dec: -0.0011080000149377156 arcsec/yr	
				Epoch of Position: 2015.5	
	Comments: T Category=St Description= Extended=N	This object was generated by Far =[Protoplanetary disks] O	the target selector and retrieved from the SIMBAD database.		
	(2)	132-1832	RA: 05 35 13.2400 (83.8051667d)	Epoch of Position: 2015.5	
			Dec: -05 18 32.95 (-5.30915d)		
			Equinox: J2000		
	Comments: T Category=St Description= Extended=N	Fhis object was generated by ar =[Protoplanetary disks] O	the target selector and retrieved from the SIMBAD database.		
	(4)	OW94-139-1853	RA: 05 35 13.8937 (83.8078904d)	Proper Motion RA: -1.146 mas/yr	
ets			Dec: -05 18 53.15 (-5.31476d)	Proper Motion Dec: 2.461 mas/yr	
эĝ.			Equinox: J2000	Parallax: 0.0028817"	
Laı				Epoch of Position: 2015.5	
Fixed	Comments: T coordinates, G = 17.1698 I = 15.883 m J = 13.517 m H = 12.053 n Ks = 11.480 Category=St Description= Extended=Net	This is the close-by reference proper motion and parallax t mag nag nag mag ear =[M stars] O	star for target acquisition for the target 132-1832, around 22.5 taken from GAIA DR2 (source identifier 301736677774953216	arcsec away from the science target. 0)	
	(5)	V357-ORI	RA: 05 35 21.5800 (83.8399167d)	Proper Motion RA: 0.682 mas/yr	
			Dec: -05 09 49.69 (-5.16380d)	Proper Motion Dec: -0.436 mas/yr	
			Equinox: J2000	Parallax: 0.0025974"	
				Epoch of Position: 2015.5	
	Comments: T coordinates, G = 16.0789 I = 14.590 m J = 13.148 m H = 12.27 m Ks = 11.670 Category=St Description= Extended=N	This is the close-by reference proper motion and parallax i mag iag ag mag g mag car =[M stars] O	star for target acquisition for the target s216-0939, around 10. aken from GAIA DR2 (source identifier 320952773773126323.	9 arcsec away from the science target. 20)	

Proposal 1741 - Targets - Solid-state water inside the snowline in planet-forming disks: exploring the origin of water on terrestrial planets

Proposal 1741 - Observation 1 - Solid-state water inside the snowline in planet-forming disks: exploring the origin of water on terrestria.

	Proposal 1741 Observation 1				0 0110				ing the ong	Sat Sep 23.0	0.00.32 GMT 2023
tio	Diagnostic Status: Warning									Sat Sep 25 0	0.00.32 01011 2023
vai	Observing Template: NIPSpac IEI	I Speetroseepy									
er	Commenter Added a lock of a horizont	specific to the MDS	DEC IEU - Laure	diana Davara I da	D.4						
bs	sources. This also increases the sci	vation to the NIRS heduling window, 1	naking it possible	to acoid scheduling	PA consi this obs	evation in the micro	ave a leakcal obsel p-meteorite avoidat	rvation to correct for nce zone.	possible contamina	tion from bright nea	rby emisison
0		,			,						
cs	(Visit 1:1) Warning (Form): Overh	eads are provision	al until the Visit F	lanner has been rur	l .						
sti											
no											
ag											
D											
	# Name	Targ	et Coordinates			Targ. Cool	rd. Corrections		Miscellaneou	IS	
ets	(1) S216-0939	RA: 0	05 35 21.5763 (83	.8399012d)		Proper Mot time/vr	ion RA: 3.3067382	217859502E-5 sec of			
arge		Dec: - Equin	-05 09 38.84 (-5.1 10x: J2000	6079d)		Proper Mot	ion Dec: -0.001108	80000149377156			
Τ						Enoch of D	osition: 2015 5				
(ec			.1	. I Commente CIMPA	Dluch	Epoch of P	08111011: 2013.3				
Ë	Comments: This object was general Category=Star	tea by the target s	elector and retriev	vea from the SIMBA	D aatabe	ise.					
	Description=[Protoplanetary disks	5]									
	Extended=NO	TA Mathad	C1	F :14		Dag Jacob Dattanna	С	T	T - 4-1	T-4-1 E	ETC With Cala
itio	# Target	I A Method	Subarray	ritter		Keauout Fattern	Groups/Int	Integrations/Exp	Integrations	Time	ID
lisi	1 5 V357-ORI	WATA	SUB32	F110W		NRSRAPID	3	1	1	0.08	58638
วูปเ											
Ac											
rs	#	Dither Type		Size		Starting	Point	Number of	Points	Points	
he	1	CYCLING		SMALL		1		4			
Dit											
ts	# Grating/Filter	Readout	Groups/Int	Integrations/Ex	Leakcal	Dither	Autocal	Total Dithe	rs Total	Total Exposure	ETC
ien	1 G235M/F170LP	NRSIRS2RAPI	8	<u>p</u> 2	false	true	NONE	4	8	1050.4	58638
lem		D	0	2	luise	inde	TIONE	·	0	1000.1	50050
al E	2 G235M/F170LP	NRSIRS2RAPI D	8	2	true	true	NONE	4	8	1050.4	
ectr	3 G395M/F290LP	NRSIRS2RAPI D	8	2	false	true	NONE	4	8	1050.4	58638
Sp	4 G395M/F290LP	NRSIRS2RAPI D	8	2	true	true	NONE	4	8	1050.4	
ŝ	Aperture PA Range 330.97253418	to 70.97253418 D	egrees (V3 192.0	to 292.0)							
ent	1		6	· · · · · · · · · · · · · · · · · · ·							
ŭ											
ire											
nb											
ē											
~											
al R											
cial R											
pecial R											

<u>Pro</u>	<u>posal 174</u>	<u> 11 - Obser</u>	<u>vation 3 - 3</u>	<u>Solid-sta</u>	<u>ate water ins</u>	<u>side the sn</u>	<u>owline in p</u>	<u>lanet-formi</u>	<u>ng disks</u>	: exploring t	<u>he origin c</u>	of water or	<u>n terrestria</u>
L C	Proposal 1741	, Observation 3										Sat Sep 23 00	0:00:32 GMT 2023
Ĕ	Diagnostic Sta	atus: Warning											
Ž	Observing Ter	nplate: MIRI Me	dium Resolution	Spectroscopy									
se													
18													
ŝ	(Visit 3:1) Wa	rning (Form): Ov	verheads are prov	isional until t	he Visit Planner ha	as been run.							
ţ;		6	I I I I I I I I I I I I I I I I I I I										
lő													
<u>او</u>													
Ϊä													
	#	Name]	Farget Coord	linates		Targ. (Coord. Correction	15	М	iscellaneous		
Ś	(1)	S216-0939	I	RA: 05 35 21.	5763 (83.8399012	d)	Proper	Motion RA: 3.306	73821785950	2E-5 sec of			
get			Ι	Dec: -05 09 3	8.84 (-5.16079d)		time/yr						
a			Η	Equinox: J200	00		Proper arcsec/	Motion Dec: -0.00	11080000149	377156			
5							Enoch	of Position: 2015.5	i				
Ň	Comments: Th	is obiect was gen	erated by the tar	get selector a	nd retrieved from	the SIMBAD datal	base.						
ιĒ	Category=Sta	r 7											
	Description=[Extended=NO	Protoplanetary d	isks]										
Ę	#						Targ	et					
Ē	1						NON	Е					
lisi													
हू													
Ă													
Ite	AcqFilter		Prin	nary Channe	1	Simultane	ous Imaging	Ir	nager Subarı	ay	Grating	g Wheel Directi	on
pa Ba	F1000W		All N	ARS		NO		F	ULL		NEUTR	RAL	
E													
Ĕ													
rs	#			Dither	Туре		Opti	nized For		Di	rection		
he	1			4-Poin	t		EXT	ENDED SOURCE		NI	EGATIVE		
Ξ													
6	#	Wavelength	Detector	Filter	Readout	Groups/Int	Integrations/	E Exposures/Dit	Dither	Total Dithers	Total	Total	ETC
a		Range			Pattern	- · · · •	хр	h			Integrations	Exposure	Wkbk.Calc ID
Ĩ	1	LONG(C)	MRSLONG		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638
Ш	1	LONG(C)	MRSSHORT		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638
a	2	MEDIUM(B)	MRSLONG		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638
t l	2	MEDIUM(B)	MRSSHORT		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638
be	3	SHORT(A)	MRSLONG		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638
lω	3	SHORT(A)	MRSSHORT		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638

Proposal 1741 - Observation 4 - Solid-state water inside the snowline in planet-forming disks: exploring the origin of water on terrestria...

n	Proposal 1741, Observation 4									Sat Sep 23 0	0:00:32 GMT 2023
atic	Diagnostic Status: Warning										
Š	Observing Template: NIRSpec IF	U Spectroscopy									
se	Comments: Added a leakcal obser	rvation to the NIRS	SPEC IFU observa	tions. Dropped the	e PA cons	straint as we nnow l	have a leakcal obser	vation to correct for	possible contamina	tion from bright nea	rby emisison
qo	sources. This also increases the so	heduling window, i	making it possible	to acoid schedulin	g this obs	sevation in the micr	o-meteorite avoidar	ice zone.			
cs	(Visit 4:1) Warning (Form): Over	neads are provision	al until the Visit P	lanner has been ru	n.						
sti											
Ö											
ag											
Ō											
s	# Name	Targ	et Coordinates			Targ. Coo	rd. Corrections		Miscellaneou	15	
jet	(2) 132-1832	RA: 0	05 35 13.2400 (83.	.8051667d)		Epoch of F	Position: 2015.5				
arç		Dec:	-05 18 32.95 (-5.3	0915d)							
μ		Equin	nox: J2000								
(ec	Comments: This object was gener	ated by the target s	elector and retriev	ved from the SIMBA	AD datab	ase.					
Ë	Description=[Protoplanetary disk	s]									
	Extended=NO		<i>a</i> 1	T 111.			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	T (1)			
tior	# Target	TA Method	Subarray	Filter		Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
isi	1 4 OW94-139-	WATA	SUB32	F110W		NRSRAPID	3	1	1	0.08	58638
nb	1853										
Ac											
irs	#	Dither Type		Size		Starting	Point	Number of l	Points	Points	
thers	#1	Dither Type CYCLING		Size SMALL		Starting	Point	Number of 1 4	Points	Points	
Dithers	#1	Dither Type CYCLING		Size SMALL		Starting 1	Point	Number of 1 4	Points	Points	
nts Dithers	# 1 #Grating/Filter	Dither Type CYCLING Readout Pattern	Groups/Int	Size SMALL Integrations/Ex p	Leakca	Starting 1 I Dither	Point Autocal	Number of 1 4 Total Dither	Points rs Total Integrations	Points Total Exposure Time	ETC Wkbk.Calc ID
ements Dithers	# 1 # Grating/Filter 1 G235M/F170LI	Dither Type CYCLING Readout Pattern NRSIRS2RAPI D	Groups/Int 25	Size SMALL Integrations/Ex p 2	Leakca false	Starting 1 I Dither true	Point Autocal NONE	Number of 1 4 Total Dither 4	Points rs Total Integrations 8	Points Total Exposure Time 3034.489	ETC Wkbk.Calc ID 58638
I Elements Dithers	# 1 Grating/Filter 1 G235M/F170L1 2 G235M/F170L1	Dither Type CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 25 25	Size SMALL Integrations/Ex p 2 2	Leakca false true	Starting 1 I Dither true true	Point Autocal NONE NONE	Number of 1 4 Total Dither 4 4 4 4	Points Total Integrations 8 8 8	Points Total Exposure Time 3034.489 3034.489	ETC Wkbk.Calc ID 58638
ectral Elements Dithers	# Grating/Filter 1 G235M/F170Ll 2 G235M/F170Ll 3 G395M/F290Ll	Dither Type CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 25 25 16	Size SMALL Integrations/Ex p 2 2 2 2	false false true false	Starting 1 I Dither true true true true	Point Autocal NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4	Points Total Integrations 8 8 8 8 8 8	Total Exposure Time 3034.489 3034.489 1984.089	 ETC Wkbk.Calc ID 58638 58638
Spectral Elements Dithers	# Grating/Filter 1 G235M/F170L1 2 G235M/F170L1 3 G395M/F290L1 4 G395M/F290L1	Dither Type CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 25 25 16 16	Size SMALL Integrations/Ex p 2 2 2 2 2 2	Leakca false true false true	Starting 1 I Dither true true true true	Point Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4 4	Points Total Integrations 8 8 8 8 8 8 8 8	Total Exposure Time 3034.489 3034.489 1984.089 1984.089	 ETC Wkbk.Calc ID 58638 58638
ts Spectral Elements Dithers	# Grating/Filter 1 G235M/F170LI 2 G235M/F170LI 3 G395M/F290LI 4 G395M/F290LI Aperture PA Range 323.97253418	Dither Type CYCLING Readout Pattern NRSIRS2RAPI D NOP NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 25 25 16 16 Degrees (V3 185.0	Size SMALL Integrations/Exp 2 2 2 2 2 2 2 0 to 62.0)	Leakca false true false true	Starting 1 I Dither true true true true	Point Autocal NONE NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4 4	Points Total Thegrations 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Total Exposure Time 3034.489 3034.489 1984.089 1984.089	 ETC Wkbk.Calc ID 58638 58638
ents Spectral Elements Dithers	# Grating/Filter 1 G235M/F170Ll 1 G235M/F170Ll 2 G235M/F170Ll 3 G395M/F290Ll 4 G395M/F290Ll Aperture PA Range 323.97253418	Dither Type CYCLING Readout pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D Store 200.97253418	Groups/Int 25 25 16 16 Degrees (V3 185.0	Size SMALL Integrations/Exp 2 2 2 2 2 2 2 0 to 62.0)	Leakca false true false true	Starting 1 I Dither true true true true	Point Autocal NONE NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4	Points Total Integrations 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Total Exposure Time 3034.489 3034.489 1984.089 1984.089	 ETC Wkbk.Calc ID 58638 58638
ements Spectral Elements Dithers	# Grating/Filter 1 G235M/F170Ll 1 G235M/F170Ll 2 G235M/F170Ll 3 G395M/F290Ll 4 G395M/F290Ll Aperture PA Range 323.97253418	Dither Type CYCLING Readout pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D Store 200.97253418	Groups/Int 25 25 16 16 Degrees (V3 185.0	Size SMALL Integrations/Exp 2 2 2 2 2 2 2 2 2 0 to 62.0)	Leakca false true false true	Starting 1 I Dither true true true true	Point Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4	Points Total Integrations 8 8 8 8 8 8 8 8 8	Total Exposure Time 3034.489 3034.489 1984.089 1984.089	 ETC Wkbk.Calc ID 58638 58638
uirements Spectral Elements Dithers	# Grating/Filter 1 G235M/F170L1 2 G235M/F170L1 3 G395M/F290L1 4 G395M/F290L1 Aperture PA Range 323.97253418	Dither Type CYCLING Readout Pattern NRSIRS2RAPI NRSIRS2RAPI NRSIRS2RAPI NRSIRS2RAPI NRSIRS2RAPI NRSIRS2RAPI D NRSIRS2RAPI D V V V V V V V V V V V V V V V	Groups/Int 25 25 16 16 16 Degrees (V3 185.0	Size SMALL Integrations/Ex p 2 2 2 2 2 2 2 0 to 62.0)	Leakca false true false true	Starting 1 I Dither true true true true	Point Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4	Points Total Integrations 8 8 8 8 8 8 8 8 8	Total Exposure Time 3034.489 3034.489 1984.089 1984.089	 ETC Wkbk.Calc ID 58638 58638
equirements Spectral Elements Dithers	# Grating/Filter 1 G235M/F170L1 2 G235M/F170L1 3 G395M/F290L1 4 G395M/F290L1 Aperture PA Range 323.97253418	Dither Type CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D O O P NRSIRS2RAPI D D Sto 200.97253418]	Groups/Int 25 25 16 16 Degrees (V3 185.0	Size SMALL Integrations/Exp 2 2 2 2 2 2 2 0 to 62.0)	Leakca false true false true	Starting 1 I Dither true true true	Point Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4	Points Total Integrations 8 8 8 8 8 8 8 8 8	Points Total Exposure Time 3034.489 3034.489 1984.089 1984.089	 ETC Wkbk.Calc ID 58638 58638
I Requirements Spectral Elements Dithers	# Grating/Filter 1 G235M/F170LI 2 G235M/F170LI 3 G395M/F290LI 4 G395M/F290LI Aperture PA Range 323.97253418	Dither Type CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D Sto 200.97253418	Groups/Int 25 25 16 16 Degrees (V3 185.0	Size SMALL Integrations/Exp 2 2 2 2 2 2 0 to 62.0)	Leakca false true false true	Starting 1 I Dither true true true true	Point Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4	Points Total Thegrations 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Total Exposure Time 3034.489 3034.489 1984.089 1984.089	 ETC Wkbk.Calc ID 58638 58638
cial Requirements Spectral Elements Dithers	# Grating/Filter 1 G235M/F170Ll 2 G235M/F170Ll 3 G395M/F290Ll 4 G395M/F290Ll Aperture PA Range 323.97253418	Dither Type CYCLING Readout pattern NRSIRS2RAPI D Store	Groups/Int 25 25 16 16 Degrees (V3 185.0	Size SMALL Integrations/Exp 2 2 2 2 2 2 2 0 to 62.0)	Leakca false true false true	Starting 1 I Dither true true true true	Point Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4	Points Total Integrations 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Total Exposure Time 3034.489 3034.489 1984.089 1984.089	 ETC Wkbk.Calc ID 58638 58638
pecial Requirements Spectral Elements Dithers	# Grating/Filter 1 G235M/F170L1 2 G235M/F170L1 3 G395M/F290L1 4 G395M/F290L1 Aperture PA Range 323.97253418	Dither Type CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D 200.97253418	Groups/Int 25 25 16 16 16 Degrees (V3 185.0	Size SMALL Integrations/Exp 2 2 2 2 2 2 0 to 62.0)	Leakca false true false true	Starting 1 I Dither true true true	Point Autocal NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4	Points Total Integrations 8 8 8 8 8 8 8 8 8	Total Exposure Time 3034.489 3034.489 1984.089 1984.089	 ETC Wkbk.Calc ID 58638 58638

Proposal 1741 - Observation 5 - Solid-state water inside the snowline in planet-forming disks: exploring the origin of water on terrestria. Sat Sep 23 00:00:32 GMT 2023 Proposal 1741, Observation 5 Observation Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Diagnostics Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. Targ. Coord. Corrections Name **Target Coordinates** Miscellaneous **Fixed Targets** RA: 05 35 13.2400 (83.8051667d) Epoch of Position: 2015.5 (2)132-1832 Dec: -05 18 32.95 (-5.30915d) Equinox: J2000 Comments: This object was generated by the target selector and retrieved from the SIMBAD database. Category=Star Description=[Protoplanetary disks] Extended=NO Acquisition Target NONE Template AcqFilter **Primary Channel Grating Wheel Direction** Simultaneous Imaging Imager Subarray F1000W All MRS NO FULL NEUTRAL Dithers **Dither Type Optimized For** Direction EXTENDED SOURCE 4-Point NEGATIVE Wavelength Detector Filter Readout Groups/Int Integrations/E Exposures/Dit Dither **Total Dithers** Total Total ETC Spectral Elements Wkbk.Calc ID Pattern Integrations Exposure Range хp h

2

2

2

2

2

2

1

1

1

1

1

1

Dither 1

Dither 1

Dither 1

Dither 1

Dither 1

Dither 1

4

4

4

4

4

4

8

8

8

8

8

8

SLOWR1

SLOWR1

SLOWR1

SLOWR1

SLOWR1

SLOWR1

23

23

23

23

23

23

LONG(C)

LONG(C)

MEDIUM(B)

MEDIUM(B)

SHORT(A)

SHORT(A)

2

2

MRSLONG

MRSLONG

MRSSHORT

MRSSHORT

MRSLONG

MRSSHORT

Time

4491.305

4491.305

4491.305

4491.305

4491.305

4491.305

82442

82442

82442

82442

82442

82442

Proposal 1711 Observation 6. Solid state water inside the spowling in planet forming disks: exploring the origin of water on terrestria

		seiva						net forming		ing the ong	n or water or	
n	Proposal 1741, Observati	on 6: Co	py of Observatio	on 1							Sat Sep 23 00	0:00:32 GMT 2023
Itic	Diagnostic Status: Warni	ng										
va	Observing Template: NIRS	Spec IFU	Spectroscopy									
er	Commente: Added a loake	l observ	speed oscopy	DEC IEU obsorry	tions Dronnad the	DA com	traint as we move l	ana a laakaal ahaar	mation to compact for	nossible contamina	tion from bright nog	hu amisisan
bs	sources. This also increase	s the sch	eduling window, r	naking it possible	to acoid schedulin	g this obs	sevation in the micr	o-meteorite avoidan	valion to correct for ice zone.	possible contamina	non from brigni neur	by emisison
0				8 - F		8						
ŝ	(Visit 6:1) Warning (Form): Overhe	eads are provision	al until the Visit P	lanner has been ru	n.						
stic	(Visit 6:1) Informational (I	Form): V	isit schedulable, b	ut most schedulin	g windows are whe	en JWST	is pointed in directi	on of greatest micro	ometeoroid impact ris	k. This is likely due	e to scheduling specia	al requirements.
ŝ		,	,		0		1	e	I	5	0 1	1
gn												
ia												
	# Name		Targe	et Coordinates			Targ. Coo	rd. Corrections		Miscellaneou	IS	
ŝ	(1) S216-0939		RA: 0	5 35 21.5763 (83	.8399012d)		Proper Mo	tion RA: 3.3067382	17859502E-5 sec of			
jet			Dec: -	-05 09 38.84 (-5.1	6079d)		time/yr					
arç			Equin	ox: J2000			Proper Mo	tion Dec: -0.001108	0000149377156			
Ĥ			1				arcsec/yr					
ed							Epoch of P	osition: 2015.5				
i.	Comments: This object wa	s general	ted by the target so	elector and retriev	ved from the SIMBA	AD datab	ase.					
-	Category=Star Description=[Protonlanet	arv disks	1									
	Extended=NO	ar y anono	1									
n	# Targe	t	TA Method	Subarray	Filter		Readout Pattern	Groups/Int	Integrations/Exp	Total	Total Exposure	ETC Wkbk.Calc
tic								-		Integrations	Time	ID
isi	1 5 V357	7-ORI	WATA	SUB32	F110W		NRSRAPID	3	1	1	0.08	58638
nb												
∆ C												
5			D:4 T		g:		<i>a.</i>	D • 4			D • 4	
ers	#				N170			L'ount				
th			Ditner Type		5120		Starting	rom	Number of I	Points	Points	
	1		CYCLING		SMALL		Starting	romt	4	Points	Points	
Di	1		CYCLING		SMALL		Starting 1	romt	4	Points	Points	
s Di	1 # Grating	/Filter	CYCLING Readout	Groups/Int	SMALL Integrations/Ex	Leakca	Starting 1 I Dither	Autocal	4 Total Dither	oints s Total	Points Total Exposure	ЕТС
nts Di	1 # Grating	/Filter	CYCLING Readout Pattern	Groups/Int	SMALL Integrations/Ex	Leakca	Starting 1 I Dither	Autocal	4 Total Dither	Points rs Total Integrations	Points Total Exposure Time	ETC Wkbk.Calc ID
nents Di	1 # Grating 1 G235M/	/ Filter F170LP	CYCLING Readout Pattern NRSIRS2RAPI	Groups/Int 8	SMALL Integrations/Ex P 2	Leakca	Starting 1 Dither true	Autocal	4 Total Dither	Points s Total Integrations 8	Total Exposure Time 1050.4	ETC Wkbk.Calc ID 58638
ements Di	1 # Grating 1 G235M/	/Filter F170LP	CYCLING Readout Pattern NRSIRS2RAPI D	Groups/Int 8	SMALL Integrations/Ex p 2	Leakca false	Starting 1 I Dither true	Autocal	4 Total Dither 4	Points s Total Integrations 8	Total Exposure Time 1050.4	ETC Wkbk.Calc ID 58638
Elements Di	1 # Grating 1 G235M/ 2 G235M/	/Filter F170LP F170LP	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI	Groups/Int 8 8	SMALL Integrations/Ex P 2 2	Leakca false true	I Dither	Autocal NONE NONE	4 Total Dither 4 4	Points S Total Integrations 8 8 8	Total Exposure Time 1050.4 1050.4	ETC Wkbk.Calc ID 58638
al Elements Di	I Grating 1 G235M/ 2 G235M/	/Filter F170LP F170LP	Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8	SMALL Integrations/Ex p 2 2 2	Leakca false true	I Dither true true	Autocal NONE NONE	4 Total Dither 4 4	Points s Total Integrations 8 8	Total Exposure Time 1050.4 1050.4	ETC Wkbk.Calc ID 58638
ctral Elements Di	1 # Grating 1 G235M/ 2 G235M/ 3 G395M/	/Filter F170LP F170LP F290LP	Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI	Groups/Int 8 8 8	SMALL SMALL 2 2 2	Leakca false true false	I Dither true true true	Autocal NONE NONE NONE	Total Dither 4 4 4 4 4 4 4 4 4 4 4	Points s Total Integrations 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
pectral Elements Di	1 # Grating 1 G235M/ 2 G235M/ 3 G395M/	/Filter F170LP F170LP F290LP	Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8	SMALL SMALL 2 2 2	Leakca false true false	I Dither true true true	Autocal NONE NONE NONE	Total Dither 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Points s Total Integrations 8 8 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
Spectral Elements Di	1 # Grating 1 G235M/ 2 G235M/ 3 G395M/ 4 G395M/	/Filter F170LP F170LP F290LP F290LP	Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8 8 8 8	SMALL SMALL 2 2 2 2 2	Leakca false true false true	I Starting I I I I I I I I I I I I I I I I I I I	Autocal NONE NONE NONE NONE	Total Dither 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Points s Total Integrations 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
s Spectral Elements Di	I Grating # G235M/ 1 G235M/ 2 G235M/ 3 G395M/ 4 G395M/ Aparture PA Pange 330 00	/Filter F170LP F170LP F290LP F290LP	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8 8 8	SMALL Integrations/Ex p 2 2 2 2 2 2 2 2 2	Leakca false true false true	I Starting I I I I I I I I I I I I I I I I I I I	Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4 4 4 4	Points s Total Integrations 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
nts Spectral Elements Di	I Grating # G235M/ 1 G235M/ 2 G235M/ 3 G395M/ 4 G395M/ Aperture PA Range 330.97	/Filter F170LP F170LP F290LP F290LP	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI	Groups/Int 8 8 8 8 8 egrees (V3 192.0	SMALL Integrations/Ex p 2 2 2 2 2 to 292.0)	Leakca false true false true	I Starting I I I I I I I I I I I I I I I I I I I	Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4 4 4 4	Points s Total Integrations 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
nents Spectral Elements Di	I # Grating 1 G235M/ 2 G235M/ 3 G395M/ 4 G395M/ Aperture PA Range 330.97	/Filter F170LP F170LP F290LP F290LP 7253418	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8 8 8 egrees (V3 192.0	SMALL Integrations/Ex p 2 2 2 2 2 to 292.0)	Leakca false true false true	I Dither true true true true true	Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4 4 4 4	Points s Total Integrations 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
ements Spectral Elements Di	I # Grating 1 G235M/ 2 G235M/ 3 G395M/ 4 G395M/ Aperture PA Range 330.97	/Filter F170LP F170LP F290LP F290LP 7253418	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8 8 8 egrees (V3 192.0	SMALL Integrations/Ex p 2 2 2 2 2 to 292.0)	Leakca false true false true	I Starting	Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4 4 4	Points s Total Integrations 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
uirements Spectral Elements Di	I # Grating 1 G235M/ 2 G235M/ 3 G395M/ 4 G395M/ Aperture PA Range 330.97	/Filter F170LP F170LP F290LP F290LP 7253418	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8 8 8 egrees (V3 192.0	SMALL Integrations/Ex p 2 2 2 2 2 to 292.0)	Leakca false true false true	I Starting	Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4 4 4	Points s Total Integrations 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
equirements Spectral Elements Di	I # Grating 1 G235M/ 2 G235M/ 3 G395M/ 4 G395M/ Aperture PA Range 330.97	/Filter F170LP F170LP F290LP F290LP '253418	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8 8 8 egrees (V3 192.0	SMALL SMALL Integrations/Ex p 2 2 2 2 2 to 292.0)	Leakca false true false true	I Starting	Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4 4	s Total Integrations 8 8 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
Requirements Spectral Elements Di	I Grating # Grating 1 G235M/ 2 G235M/ 3 G395M/ 4 G395M/ Aperture PA Range 330.97	/Filter F170LP F170LP F290LP F290LP	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8 8 8 egrees (V3 192.0	SMALL Integrations/Ex p 2 2 2 2 to 292.0)	Leakca false true false true	I Starting	Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4	s Total Integrations 8 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
al Requirements Spectral Elements Di	I Grating # G235M/ 1 G235M/ 2 G235M/ 3 G395M/ 4 G395M/ Aperture PA Range 330.97	/Filter F170LP F170LP F290LP F290LP	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8 8 8 egrees (V3 192.0	SMALL Integrations/Ex p 2 2 2 2 2 to 292.0)	Leakca false true false true	I Starting	Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4	s Total Integrations 8 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
scial Requirements Spectral Elements Di	I Grating # G235M/ 1 G235M/ 2 G235M/ 3 G395M/ 4 G395M/ Aperture PA Range 330.97	/Filter F170LP F170LP F290LP F290LP /253418	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8 8 8 egrees (V3 192.0	SMALL Integrations/Ex p 2 2 2 2 2 to 292.0)	Leakca false true false true	I Starting	Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4 4	Points s Total Integrations 8 8 8 8 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638
Special Requirements Spectral Elements Di	Image: system of the system	/Filter F170LP F170LP F290LP F290LP /253418	CYCLING Readout Pattern NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D NRSIRS2RAPI D	Groups/Int 8 8 8 8 egrees (V3 192.0	SMALL Integrations/Ex p 2 2 2 2 2 to 292.0)	Leakca false true false true	I Starting	Autocal NONE NONE NONE NONE	Number of 1 4 Total Dither 4 4 4 4 4 4	Points s Total Integrations 8 8 8 8 8 8 8 8	Total Exposure Time 1050.4 1050.4 1050.4 1050.4	ETC Wkbk.Calc ID 58638 58638

Proposal 1741 - Observation 7 - Solid-state water inside the snowline in planet-forming disks: exploring the origin of water on terrestria...

110		0000170	10117 = 001					netionning				
u o	Proposal 1741, Ob	servation 7: Co	opy of Observatio	n 4							Sat Sep 23 0	0:00:32 GMT 2023
atio	Diagnostic Status:	Warning										
Š	Observing Templat	e: NIRSpec IFU	Spectroscopy									
ŝ	Comments: Added	a leakcal observ	vation to the NIRS	PEC IEU observa	tions Dropped the	PA con	straint as we nnow l	have a leakcal obser	vation to correct for	possible contamina	tion from bright nea	rhy emisison
ğ	sources. This also in	ncreases the sch	eduling window, n	naking it possible	to acoid schedulin	g this ob	sevation in the micr	o-meteorite avoidar	ice zone.	possible contamina	uon from origin neu	roy emisison
0			, in the second s	• •		°						
SS	(Visit 7:1) Warning	(Form): Overh	eads are provisiona	al until the Visit P	lanner has been ru	n.						
šť	(Visit 7:1) Informat	tional (Form): V	isit schedulable, b	ut most scheduling	g windows are who	en JWST	is pointed in directi	on of greatest micro	ometeoroid impact ris	k. This is likely due	e to scheduling speci	al requirements.
ő					-		*	-	•	•	• •	
g												
) ia												
S	# Nam	ne	Targe	et Coordinates			Targ. Coo	rd. Corrections		Miscellaneou	S	
et	(2) 132-	1832	RA: 0	5 35 13.2400 (83.	8051667d)		Epoch of P	osition: 2015.5				
rg			Dec: -	05 18 32.95 (-5.3	0915d)							
Ца			Equin	ox: J2000								
σ	Comments: This ob	iect was genera	ted by the target s	lector and retrie	ad from the SIMR	AD datak	252					
Xe	Category=Star	jeci was genera	ieu by ine iurgei se	lector and retriev	ea from the Shub	1D uulut	use.					
ΪĒ	Description=[Proto	oplanetary disks]									
-	Extended=NO	_										
5	#	Target	TA Method	Subarray	Filter		Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure	ETC Wkbk.Calc
ïťi	1	4 00004 120		CLID 22	F110W			2				1D 59(20
lis	1	4 OW94-139- 1853	WATA	SUB32	FIIOW		NRSRAPID	3	1	1	0.08	58638
ğ		1055										
Ă												
rs	#		Dither Type		Size		Starting	Point	Number of I	Points	Points	
he	1		CYCLING		SMALL		1		4			
<u>it</u>												
	# 0	rating/Filtor	Pondout	Croups/Int	Integrations/Fy	Looker	Dithor	Autocal	Total Dithor	e Total	Total Exposure	FTC
lts	# 6	Frating/Filter	Pattern	Groups/Int	p	Leakca	u Ditilei	Autocal	Total Dittle	Integrations	Time	Wkbk.Calc ID
nei	1 6	6235M/F170LP	NRSIRS2RAPI	25	2	false	true	NONE	4	8	3034.489	58638
ler			D									
Щ	2 6	3235M/F170LP	NRSIRS2RAPI	25	2	true	true	NONE	4	8	3034.489	
N			D									
4	3 0	395M/F290LP	D NRSIRS2RAPI	16	2	false	true	NONE	4	8	1984.089	58638
ectr	3 0	3395M/F290LP	D NRSIRS2RAPI D	16	2	false	true	NONE	4	8	1984.089	58638
Spectr	3 C 4 C	3395M/F290LP 3395M/F290LP	D NRSIRS2RAPI D NRSIRS2RAPI	16 16	2 2	false true	true	NONE	4	8	1984.089 1984.089	58638
Spectr	3 G 4 G	3395M/F290LP 3395M/F290LP	D NRSIRS2RAPI D NRSIRS2RAPI D	16 16	2 2	false true	true	NONE NONE	4	8 8	1984.089 1984.089	58638
nts Spectr	3 C 4 C	3395M/F290LP 3395M/F290LP 323.97253418	D NRSIRS2RAPI D NRSIRS2RAPI D to 200.97253418 I	16 16 Degrees (V3 185.0	2 2 0 to 62.0)	false true	true	NONE NONE	4	8 8	1984.089 1984.089	58638
ents Spectr	3 C 4 C Aperture PA Range	3395M/F290LP 3395M/F290LP 323.97253418	D NRSIRS2RAPI D NRSIRS2RAPI D to 200.97253418 I	16 16 Degrees (V3 185.0	2 2 0 to 62.0)	false true	true	NONE	4	8	1984.089 1984.089	58638
ements Spectr	3 C 4 C Aperture PA Range	3395M/F290LP 3395M/F290LP 323.97253418	D NRSIRS2RAPI D NRSIRS2RAPI D to 200.97253418 I	16 16 Degrees (V3 185.0	2 2 0 to 62.0)	false true	true	NONE	4	8	1984.089 1984.089	58638
irements Spectr	3 C 4 C Aperture PA Range	3395M/F290LP 3395M/F290LP 323.97253418	D NRSIRS2RAPI D NRSIRS2RAPI D to 200.97253418 I	16 16 Degrees (V3 185.0	2 2 0 to 62.0)	false true	true	NONE	4	8	1984.089 1984.089	58638
quirements Spectr	3 C 4 C Aperture PA Range	3395M/F290LP 3395M/F290LP 323.97253418	D NRSIRS2RAPI D NRSIRS2RAPI D to 200.97253418 I	16 16 Degrees (V3 185.0	2 2 0 to 62.0)	false true	true	NONE	4	8	1984.089 1984.089	58638
Requirements Spectr	3 C 4 C	3395M/F290LP 3395M/F290LP 323.97253418	D NRSIRS2RAPI D NRSIRS2RAPI D to 200.97253418 I	16 16 Degrees (V3 185.0	2 2) to 62.0)	false true	true	NONE	4	8	1984.089 1984.089	58638
al Requirements Spectr	3 C 4 C	3395M/F290LP 3395M/F290LP 323.97253418	D NRSIRS2RAPI D NRSIRS2RAPI D to 200.97253418 I	16 16 Degrees (V3 185.0	2 2) to 62.0)	false true	true	NONE	4	8	1984.089 1984.089	58638
cial Requirements Spectr	3 C 4 C	3395M/F290LP 3395M/F290LP 323.97253418	D NRSIRS2RAPI D NRSIRS2RAPI D to 200.97253418 I	16 16 Degrees (V3 185.0	2 2) to 62.0)	false true	true	NONE	4	8	1984.089 1984.089	58638
pecial Requirements Spectr	3 C 4 C	3395M/F290LP 3395M/F290LP 323.97253418	D NRSIRS2RAPI D NRSIRS2RAPI D to 200.97253418 I	16 16 Degrees (V3 185.0	2 2 0 to 62.0)	false true	true	NONE	4	8	1984.089 1984.089	58638