



2025 - The Chemistry of Planet Formation: A JWST-ALMA Survey of 4 Planet-Forming Disks

Cycle: 1, Proposal Category: GO

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
MIRI MRS				
	1	AS 209 MIRI MRS	MIRI Medium Resolution Spectroscopy	(1) EM-AS-209
	2	GM Aur MIRI MRS	MIRI Medium Resolution Spectroscopy	(2) V-GM-AUR
	7	GM Aur MIRI MRS	MIRI Medium Resolution Spectroscopy	(2) V-GM-AUR
	3	MWC 480 MIRI MRS	MIRI Medium Resolution Spectroscopy	(3) HD-31648
	4	HD 163296 MIRI MRS	MIRI Medium Resolution Spectroscopy	(4) HD-163296
	5	MWC 480 MIRI MRS (copy of failed observation 3)	MIRI Medium Resolution Spectroscopy	(3) HD-31648
	6	MWC 480 MIRI MRS (copy of failed observation 5)	MIRI Medium Resolution Spectroscopy	(3) HD-31648

ABSTRACT

Planets form and obtain their volatile inventories in disks around young stars. ALMA has recently completed a large program on the chemistry of 5 such disks at spatial resolutions of 10-15 au. The gas structure and chemical composition of their outer disk regions (>10 au) have been characterized in exquisite detail, revealing an impressive chemical and morphological diversity. We propose to use MIRI to obtain the complementary chemical composition of the inner 10 au of 4/5 of these disks (the 5th is part of a GTO program). The resulting data set will provide a complete chemical inventory from the small terrestrial planet-forming scales to the outer disk regions where e.g. comets may assemble. We will use the combined JWST-ALMA data set to retrieve the radial column density profiles of the main carriers of volatile C and O, of probes of the C/N/O/S gas-phase elemental ratios, and of key organic molecules across all planet-forming radii. This legacy data set will enable the best constraints to date on the composition of planet forming material at different disk radii, and on the dynamical and chemical links between different disk regions.

OBSERVING DESCRIPTION

This program aims at obtain deep MIRI MRS spectral imaging of 4 protoplanetary disks: GM Aur, AS 209, HD 163296 and MWC 480. The spectra will cover the full range from 5 to 28 micron, using all three available sub-bands. 3 of the 4 targets are too bright for TA, even with the ND filter, but

JWST Proposal 2025 (Created: Tuesday, September 19, 2023 at 2:00:54 PM Eastern Standard Time) - Overview

GM Aur is faint enough for TA, so it is enabled here to optimize the reproducibility of the spectro-photometric calibration, and in particular to aid in defringing of the central point source. We anticipate somewhat lower accuracy in spectro-photometric calibration with TA, but the pointing accuracy of the observatory should be good enough to ensure that all 4 dither points are fully enclosed in the MRS FOV, even in Channel 1. As recommended, the 4-point dither pattern is used.

GM Aur uses SLOWR1 to avoid triggering the data volume warning. The other targets can use FASTR1.

Proposal 2025 - Targets - The Chemistry of Planet Formation: A JWST-ALMA Survey of 4 Planet-Forming Disks

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	EM-AS-209	RA: 16 49 15.2956 (252.3137317d) Dec: -14 22 9.01 (-14.36917d) Equinox: J2000	Proper Motion RA: -5.104346764439603E-4 sec of time/yr Proper Motion Dec: -0.023732999898129492 arcsec/yr Epoch of Position: 2015.5	
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Protoplanetary disks, T Tauri stars] Extended=NO				
	(2)	V-GM-AUR	RA: 04 55 10.9860 (73.7957750d) Dec: +30 21 59.00 (30.36639d) Equinox: J2000	Proper Motion RA: 3.012635677084487E-4 sec of time/yr Proper Motion Dec: -0.02445099994474731 arcsec/yr Epoch of Position: 2015.5	
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Protoplanetary disks, T Tauri stars] Extended=NO				
	(3)	HD-31648	RA: 04 58 46.2711 (74.6927963d) Dec: +29 50 36.60 (29.84350d) Equinox: J2000	Proper Motion RA: 3.6838574085603157E-4 sec of time/yr Proper Motion Dec: -0.025348000076519384 arcsec/yr Epoch of Position: 2015.5	
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Source is referred to AS MWC 480 in the proposal. Category=Star Description=[Herbig Ae/Be stars, Protoplanetary disks]				
	(4)	HD-163296	RA: 17 56 21.2797 (269.0886654d) Dec: -21 57 22.48 (-21.95624d) Equinox: J2000	Proper Motion RA: -5.467923715382945E-4 sec of time/yr Proper Motion Dec: -0.03941999996186496 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Herbig Ae/Be stars, Protoplanetary disks]					

Proposal 2025 - Observation 1 - The Chemistry of Planet Formation: A JWST-ALMA Survey of 4 Planet-Forming Disks

Observation	Proposal 2025, Observation 1: AS 209 MIRI MRS												Tue Sep 19 19:00:54 GMT 2023	
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
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)	EM-AS-209		RA: 16 49 15.2956 (252.3137317d) Dec: -14 22 9.01 (-14.36917d) Equinox: J2000			Proper Motion RA: -5.104346764439603E-4 sec of time/yr Proper Motion Dec: -0.023732999898129492 arcsec/yr Epoch of Position: 2015.5							
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.													
	Category=Star													
	Description=[Protoplanetary disks, T Tauri stars]													
Extended=NO														
Acquisition	#	Target												
	1	NONE												
Template	AcqFilter	Primary Channel			Simultaneous Imaging			Imager Subarray			Grating Wheel Direction			
	FND	All MRS			YES			FULL			NEUTRAL			
Dithers	#	Dither Type				Optimized For				Direction				
	1	4-Point				POINT 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	F770W	FASTR1	6	5	1	Dither 1	4	20	377.405		
	1	SHORT(A)	MRSLONG		FASTR1	6	29	1	Dither 1	4	116	2242.232	62372	
	1	SHORT(A)	MRSSHORT		FASTR1	6	29	1	Dither 1	4	116	2242.232	62372	
	2		IMAGER	F770W	FASTR1	6	5	1	Dither 1	4	20	377.405		
	2	MEDIUM(B)	MRSLONG		FASTR1	6	29	1	Dither 1	4	116	2242.232	62372	
	2	MEDIUM(B)	MRSSHORT		FASTR1	6	29	1	Dither 1	4	116	2242.232	62372	
	3		IMAGER	F770W	FASTR1	6	5	1	Dither 1	4	20	377.405		
	3	LONG(C)	MRSLONG		FASTR1	6	29	1	Dither 1	4	116	2242.232	62372	
	3	LONG(C)	MRSSHORT		FASTR1	6	29	1	Dither 1	4	116	2242.232	62372	

Proposal 2025 - Observation 2 - The Chemistry of Planet Formation: A JWST-ALMA Survey of 4 Planet-Forming Disks

Observation	Proposal 2025, Observation 2: GM Aur MIRI MRS												Tue Sep 19 19:00:54 GMT 2023	
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
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)	V-GM-AUR	RA: 04 55 10.9860 (73.7957750d) Dec: +30 21 59.00 (30.36639d) Equinox: J2000				Proper Motion RA: 3.012635677084487E-4 sec of time/yr Proper Motion Dec: -0.02445099994474731 arcsec/yr Epoch of Position: 2015.5							
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.													
	Category=Star													
	Description=[Protoplanetary disks, T Tauri stars] Extended=NO													
Acquisition	#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp		Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID				
	1	SAME	FND	FAST	4	1		1	11.1	84176.2				
Template	Primary Channel			Simultaneous Imaging			Imager Subarray			Grating Wheel Direction				
	All MRS			YES			FULL			NEUTRAL				
Dithers	#	Dither Type				Optimized For				Direction				
	1	4-Point				POINT SOURCE				NEGATIVE				
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	1	LONG(C)	MRSLONG		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	
	1	LONG(C)	MRSSHORT		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	
	2		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	2	MEDIUM(B)	MRSLONG		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	
	2	MEDIUM(B)	MRSSHORT		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	
	3		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	3	SHORT(A)	MRSLONG		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	
	3	SHORT(A)	MRSSHORT		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	

Proposal 2025 - Observation 7 - The Chemistry of Planet Formation: A JWST-ALMA Survey of 4 Planet-Forming Disks

Observation	Proposal 2025, Observation 7: GM Aur MIRI MRS												Tue Sep 19 19:00:54 GMT 2023	
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
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			
	(2)	V-GM-AUR	RA: 04 55 10.9860 (73.7957750d) Dec: +30 21 59.00 (30.36639d) Equinox: J2000				Proper Motion RA: 3.012635677084487E-4 sec of time/yr Proper Motion Dec: -0.02445099994474731 arcsec/yr Epoch of Position: 2015.5							
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.													
	Category=Star Description=[Protoplanetary disks, T Tauri stars] Extended=NO													
Acquisition	#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp		Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID				
	1	SAME	FND	FAST	4	1		1	11.1	84176.2				
Template	Primary Channel		Simultaneous Imaging				Imager Subarray				Grating Wheel Direction			
	All MRS		YES				FULL				NEUTRAL			
Dithers	#	Dither Type				Optimized For				Direction				
	1	4-Point				POINT SOURCE				NEGATIVE				
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	1	SHORT(A)	MRSLONG		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	
	1	SHORT(A)	MRSSHORT		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	
	2		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	2	MEDIUM(B)	MRSLONG		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	
	2	MEDIUM(B)	MRSSHORT		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	
	3		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	3	LONG(C)	MRSLONG		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	
	3	LONG(C)	MRSSHORT		SLOWR1	10	3	1	Dither 1	4	12	3057.91	63745	

Proposal 2025 - Observation 3 - The Chemistry of Planet Formation: A JWST-ALMA Survey of 4 Planet-Forming Disks

Observation	Proposal 2025, Observation 3: MWC 480 MIRI MRS												Tue Sep 19 19:00:54 GMT 2023	
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
	Comments: Based on the ETC we should reduce the number of groups to <5 to not fully saturate, but this caused a warning during submission.													
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)	HD-31648	RA: 04 58 46.2711 (74.6927963d) Dec: +29 50 36.60 (29.84350d) Equinox: J2000				Proper Motion RA: 3.6838574085603157E-4 sec of time/yr Proper Motion Dec: -0.025348000076519384 arcsec/yr Epoch of Position: 2015.5				Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Source is referred to AS MWC 480 in the proposal. Category=Star Description=[Herbig Ae/Be stars, Protoplanetary disks]			
Acquisition	#	Target												
	1	NONE												
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray			Grating Wheel Direction		
	FND	All MRS				YES			FULL			NEUTRAL		
Dithers	#	Dither Type					Optimized For				Direction			
	1	4-Point					POINT SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	1	SHORT(A)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	1	SHORT(A)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	2		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	2	MEDIUM(B)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	2	MEDIUM(B)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	3		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	3	LONG(C)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	3	LONG(C)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	

Proposal 2025 - Observation 4 - The Chemistry of Planet Formation: A JWST-ALMA Survey of 4 Planet-Forming Disks

Observation	Proposal 2025, Observation 4: HD 163296 MIRI MRS												Tue Sep 19 19:00:54 GMT 2023	
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
	Comments: Based on the ETC we should reduce the number of groups to <5 to not fully saturate, but this caused a warning during submission.													
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)	HD-163296	RA: 17 56 21.2797 (269.0886654d) Dec: -21 57 22.48 (-21.95624d) Equinox: J2000				Proper Motion RA: -5.467923715382945E-4 sec of time/yr Proper Motion Dec: -0.03941999996186496 arcsec/yr Epoch of Position: 2015.5							
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.													
	Category=Star Description=[Herbig Ae/Be stars, Protoplanetary disks]													
Acquisition	#	Target												
	1	NONE												
Template	AcqFilter	Primary Channel				Simultaneous Imaging				Imager Subarray		Grating Wheel Direction		
	FND	All MRS				YES				FULL		NEUTRAL		
Dithers	#	Dither Type				Optimized For				Direction				
	1	4-Point				POINT SOURCE				NEGATIVE				
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F1130W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	1	SHORT(A)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63776	
	1	SHORT(A)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63776	
	2		IMAGER	F1130W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	2	MEDIUM(B)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63776	
	2	MEDIUM(B)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63776	
	3		IMAGER	F1130W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	3	LONG(C)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63776	
	3	LONG(C)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63776	

Proposal 2025 - Observation 5 - The Chemistry of Planet Formation: A JWST-ALMA Survey of 4 Planet-Forming Disks

Observation	Proposal 2025, Observation 5: MWC 480 MIRI MRS (copy of failed observation 3)												Tue Sep 19 19:00:54 GMT 2023	
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
	Comments: Based on the ETC we should reduce the number of groups to <5 to not fully saturate, but this caused a warning during submission.													
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			
	(3)	HD-31648	RA: 04 58 46.2711 (74.6927963d) Dec: +29 50 36.60 (29.84350d) Equinox: J2000				Proper Motion RA: 3.6838574085603157E-4 sec of time/yr Proper Motion Dec: -0.025348000076519384 arcsec/yr Epoch of Position: 2015.5							
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Source is referred to AS MWC 480 in the proposal.													
	Category=Star													
	Description=[Herbig Ae/Be stars, Protoplanetary disks]													
Acquisition	#	Target												
	1	NONE												
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	FND	All MRS				YES			FULL		NEUTRAL			
Dithers	#	Dither Type					Optimized For				Direction			
	1	4-Point					POINT SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	1	LONG(C)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	1	LONG(C)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	2		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	2	MEDIUM(B)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	2	MEDIUM(B)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	3		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	3	SHORT(A)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	3	SHORT(A)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	

Proposal 2025 - Observation 6 - The Chemistry of Planet Formation: A JWST-ALMA Survey of 4 Planet-Forming Disks

Observation	Proposal 2025, Observation 6: MWC 480 MIRI MRS (copy of failed observation 5)												Tue Sep 19 19:00:54 GMT 2023	
	Diagnostic Status: Warning													
	Observing Template: MIRI Medium Resolution Spectroscopy													
	Comments: Based on the ETC we should reduce the number of groups to <5 to not fully saturate, but this caused a warning during submission.													
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			
	(3)	HD-31648	RA: 04 58 46.2711 (74.6927963d) Dec: +29 50 36.60 (29.84350d) Equinox: J2000				Proper Motion RA: 3.6838574085603157E-4 sec of time/yr Proper Motion Dec: -0.025348000076519384 arcsec/yr Epoch of Position: 2015.5							
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Source is referred to AS MWC 480 in the proposal.													
	Category=Star													
	Description=[Herbig Ae/Be stars, Protoplanetary disks]													
Acquisition	#	Target												
	1	NONE												
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	FND	All MRS				YES			FULL		NEUTRAL			
Dithers	#	Dither Type				Optimized For				Direction				
	1	4-Point				POINT SOURCE				NEGATIVE				
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	1	SHORT(A)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	1	SHORT(A)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	2		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	2	MEDIUM(B)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	2	MEDIUM(B)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	3		IMAGER	F770W	FASTR1	5	5	1	Dither 1	4	20	321.905		
	3	LONG(C)	MRSLONG		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	
	3	LONG(C)	MRSSHORT		FASTR1	5	34	1	Dither 1	4	136	2253.332	63764	