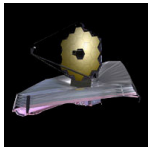

5749 - The Red Rectangle: a space laboratory for the formation and evolution of interstellar carbon material

Cycle: 3, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	HD 44179 GO1 MIRI	MIRI Medium Resolution Spectroscopy	(1) HD-44179-GO1
	2	HD 44179 P1 MIRI	MIRI Medium Resolution Spectroscopy	(2) HD-44179-P1
	3	HD 44179 P2 MIRI	MIRI Medium Resolution Spectroscopy	(3) HD-44179-P2
	4	HD 44179 P3 MIRI	MIRI Medium Resolution Spectroscopy	(4) HD-44179-P3
	5	HD 44179 BKG MIRI	MIRI Medium Resolution Spectroscopy	(5) HD-44179-BKG

ABSTRACT

Astrophysical dust grains and molecules are fundamental components of the Universe. Their interactions with gases, photons, sub-atomic particles, and cosmic rays drive the evolution of the interstellar medium from the first generations of stars to star/planet formation.

Large carbon molecules and dust particles exhibit numerous and omnipresent spectral signatures imprinted on astronomical spectra from the UV to the IR: 1) the very strong 2175 angstrom absorption band in the interstellar extinction curve; 2) the blue luminescence - optical emission peaking at 380 nm; 3) the diffuse interstellar bands - hundreds of unassigned optical and near-IR diffuse Galactic and extragalactic interstellar absorption bands; 4) the extended red emission - broad optical emission between 500-1000 nm widespread through the Galaxy; 5) the aromatic infrared band emission dominating the IR spectra of star-forming regions, ISM, and galaxies. A key difficulty in figuring out how these phenomena and their carriers are related is that it has not been possible to study these phenomena at the same time in the same object - until now.

We propose to use the incredible spatial and spectral resolution of JWST to obtain MIRI-MRS spectra across the Red Rectangle, a unique nebula surrounding an evolved star, that exhibits all these signatures of carbonaceous dust at the same time. These spectra will, for the first time, connect these important interstellar carbonaceous materials in a well characterised environment, reveal their IR spectroscopic fingerprints, bring us closer to deciphering dust formation and photo-processing and to identifying new species of the interstellar carbon inventory.

OBSERVING DESCRIPTION

The Red Rectangle (HD44179) will be observed with MIRI MRS at 4 locations within the nebula.

The entire MIRI-MRS wavelength coverage is observed (SHORT/MEDIUM/LONG), and parallel imaging is included in three filters: F770W, F1000W, F1130W.
MIRI MRS dithering is implemented for all observations as a 4-point extended source dither.

Dedicated background observations are taken.

We set a position angle constraint to select one of the two observing windows in order to avoid the Micrometeoroid Avoidance Zone.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	HD-44179-GO1	RA: 06 19 57.9800 (94.9915833d) Dec: -10 38 7.22 (-10.63534d) Equinox: J2000	Proper Motion RA: -4.3819722160173255E-4 sec of time/yr Proper Motion Dec: -0.02273999996305065 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=ISM* *Description=[Dust nebulae, Interstellar dust, Interstellar molecules]* *Extended=YES*				
(2)	HD-44179-P1	RA: 06 19 57.8929 (94.9912204d) Dec: -10 38 19.67 (-10.63880d) Equinox: J2000	Proper Motion RA: -4.3819722160173255E-4 sec of time/yr Proper Motion Dec: -0.02273999996305065 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=ISM* *Description=[Dust nebulae, Interstellar dust, Interstellar molecules]* *Extended=YES*				
(3)	HD-44179-P2	RA: 06 19 57.7655 (94.9906896d) Dec: -10 38 21.35 (-10.63926d) Equinox: J2000	Proper Motion RA: -4.3819722160173255E-4 sec of time/yr Proper Motion Dec: -0.02273999996305065 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=ISM* *Description=[Dust nebulae, Interstellar dust, Interstellar molecules]* *Extended=YES*				
(4)	HD-44179-P3	RA: 06 19 57.6759 (94.9903162d) Dec: -10 38 13.53 (-10.63709d) Equinox: J2000	Proper Motion RA: -4.3819722160173255E-4 sec of time/yr Proper Motion Dec: -0.02273999996305065 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=ISM* *Description=[Dust nebulae, Interstellar dust, Interstellar molecules]* *Extended=YES*				
(5)	HD-44179-BKG	RA: 06 19 47.1620 (94.9465083d) Dec: -10 38 19.06 (-10.63863d) Equinox: J2000	Proper Motion RA: -4.3819722160173255E-4 sec of time/yr Proper Motion Dec: -0.02273999996305065 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=ISM* *Description=[Dust nebulae, Interstellar dust, Interstellar molecules]* *Extended=YES*				

Observation

Proposal 5749, Observation 1: HD 44179 GO1 MIRI

Fri Jan 31 22:00:18 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[HD 44179 BKG MIRI (Obs 5)]

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)	HD-44179-GO1	RA: 06 19 57.9800 (94.9915833d) Dec: -10 38 7.22 (-10.63534d) Equinox: J2000	Proper Motion RA: -4.3819722160173255E-4 sec of time/yr Proper Motion Dec: -0.02273999996305065 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=ISM
Description=[Dust nebulae, Interstellar dust, Interstellar molecules]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	YES	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED 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	1	1	Dither 1	4	4	55.501	
1	LONG(C)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
1	LONG(C)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	
2		IMAGER	F1000W	FASTR1	5	1	1	Dither 1	4	4	55.501	
2	MEDIUM(B)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
2	MEDIUM(B)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	
3	SHORT(A)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
3	SHORT(A)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	

Special Requirements	
	Aperture PA Range 68.0 to 72.0 Degrees (V3 68.0 to 72.0) Group Observations 1, 2, 3, 4, 5, Non-interruptible

Observation

Proposal 5749, Observation 2: HD 44179 P1 MIRI Fri Jan 31 22:00:18 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[HD 44179 BKG MIRI (Obs 5)]

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)	HD-44179-P1	RA: 06 19 57.8929 (94.9912204d) Dec: -10 38 19.67 (-10.63880d) Equinox: J2000	Proper Motion RA: -4.3819722160173255E-4 sec of time/yr Proper Motion Dec: -0.02273999996305065 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=ISM
Description=[Dust nebulae, Interstellar dust, Interstellar molecules]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	YES	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED 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	1	1	Dither 1	4	4	55.501	
1	LONG(C)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
1	LONG(C)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	
2		IMAGER	F1000W	FASTR1	5	1	1	Dither 1	4	4	55.501	
2	MEDIUM(B)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
2	MEDIUM(B)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	
3	SHORT(A)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
3	SHORT(A)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	

Special Requirements	
	Aperture PA Range 70.0 to 75.0 Degrees (V3 70.0 to 75.0) Group Observations 1, 2, 3, 4, 5, Non-interruptible

Observation

Proposal 5749, Observation 3: HD 44179 P2 MIRI Fri Jan 31 22:00:18 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[HD 44179 BKG MIRI (Obs 5)]

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-44179-P2	RA: 06 19 57.7655 (94.9906896d) Dec: -10 38 21.35 (-10.63926d) Equinox: J2000	Proper Motion RA: -4.3819722160173255E-4 sec of time/yr Proper Motion Dec: -0.02273999996305065 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=ISM
Description=[Dust nebulae, Interstellar dust, Interstellar molecules]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	YES	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED 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	1	1	Dither 1	4	4	55.501	
1	LONG(C)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
1	LONG(C)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	
2		IMAGER	F1000W	FASTR1	5	1	1	Dither 1	4	4	55.501	
2	MEDIUM(B)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
2	MEDIUM(B)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	
3	SHORT(A)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
3	SHORT(A)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	

Special Requirements	Aperture PA Range 70.0 to 80.0 Degrees (V3 70.0 to 80.0) Group Observations 1, 2, 3, 4, 5, Non-interruptible

Observation

Proposal 5749, Observation 4: HD 44179 P3 MIRI Fri Jan 31 22:00:18 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[HD 44179 BKG MIRI (Obs 5)]

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-44179-P3	RA: 06 19 57.6759 (94.9903162d) Dec: -10 38 13.53 (-10.63709d) Equinox: J2000	Proper Motion RA: -4.3819722160173255E-4 sec of time/yr Proper Motion Dec: -0.02273999996305065 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=ISM
Description=[Dust nebulae, Interstellar dust, Interstellar molecules]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	YES	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED 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	1	1	Dither 1	4	4	55.501	
1	LONG(C)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
1	LONG(C)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	
2		IMAGER	F1000W	FASTR1	5	1	1	Dither 1	4	4	55.501	
2	MEDIUM(B)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
2	MEDIUM(B)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	
3	SHORT(A)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
3	SHORT(A)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	

Special Requirements	
	Aperture PA Range 70.0 to 73.0 Degrees (V3 70.0 to 73.0) Group Observations 1, 2, 3, 4, 5, Non-interruptible

Observation

Proposal 5749, Observation 5: HD 44179 BKG MIRI Fri Jan 31 22:00:18 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [HD 44179 GO1 MIRI (Obs 1), HD 44179 P1 MIRI (Obs 2), HD 44179 P2 MIRI (Obs 3), HD 44179 P3 MIRI (Obs 4)]

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)	HD-44179-BKG	RA: 06 19 47.1620 (94.9465083d) Dec: -10 38 19.06 (-10.63863d) Equinox: J2000	Proper Motion RA: -4.3819722160173255E-4 sec of time/yr Proper Motion Dec: -0.02273999996305065 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=ISM
Description=[Dust nebulae, Interstellar dust, Interstellar molecules]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	YES	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED 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	1	1	Dither 1	4	4	55.501	
1	LONG(C)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
1	LONG(C)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	
2		IMAGER	F1000W	FASTR1	5	1	1	Dither 1	4	4	55.501	
2	MEDIUM(B)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
2	MEDIUM(B)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	
3		IMAGER	F770W	FASTR1	5	1	1	Dither 1	4	4	55.501	
3	SHORT(A)	MRSLONG		FASTR1	10	2	1	Dither 1	4	8	233.103	
3	SHORT(A)	MRSSHORT		FASTR1	10	2	1	Dither 1	4	8	233.103	

Special Requirements	Group Observations 1, 2, 3, 4, 5, Non-interruptible