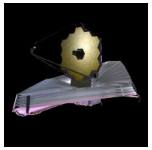

12108 - Probing the origins and evolution of water-rich asteroids using the targets of the Emirates Mission to the Asteroid belt

Cycle: 5, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MRS				
	3	Chimaera	MIRI Medium Resolution Spectroscopy	(3) 623
	4	Chimaera background	MIRI Medium Resolution Spectroscopy	(4) 623-background
LRS				
	5	10253	MIRI Low Resolution Spectroscopy	(5) 10253
	6	13294	MIRI Low Resolution Spectroscopy	(6) 13294
	7	23871	MIRI Low Resolution Spectroscopy	(7) 23871
	8	59980	MIRI Low Resolution Spectroscopy	(8) 59980
	9	88055	MIRI Low Resolution Spectroscopy	(9) 88055

ABSTRACT

The science goal of the Emirates Mission to the Asteroid belt (EMA) mission is to "probe the origin and evolution of water-rich asteroids". In alignment with this science goal, the three objectives of this proposal are: 1) Determine if heliocentric distance is indicative of amount of hydration or if some evolutionary process has occurred; 2) Determine if aqueous alteration processes are correlated with physical properties of asteroids; and 3)

Distinguish between hydrated (CI, CM) or anhydrous (CV, CO) chondrites as analogue materials. In the mid-infrared (MIR), primitive asteroid spectra present emission features indicative of composition, hydration, grain size, and thermal properties. As the EMA targets are expected to be water-rich, the three MIR spectral features we focus on in this proposal are the 6 μm emission feature indicative of molecular water, features in and adjacent to the 10 μm emission plateau indicative of degree of aqueous alteration, and the Christiansen feature indicative of mineralogy. The bandpass, high spectral resolution, and high SNR of JWST make detections of these three features possible.

OBSERVING DESCRIPTION

We propose to observe asteroid (623) Chimaera with MIRI MRS, and asteroids (10253) Westerwald, (13294) Rockox, (23871) Ousha, (59980) Moza, and (88055) Ghaf with MIRI LRS. We will detect and, if present, measure the 6 micron feature, 10 micron plateau, and Christiansen feature for each asteroid. Based on previous detections of relevant spectral features, we require a SNR > 100 for all channels. We calculated exposure times of each channel to allow for wavelengths with spectral features of interest to have a SNR > 100 while ensuring that the detector does not saturate, regardless of observation date. The total APT-estimated exposure time is 9.1 hours, including overhead, making this a very small proposal.

MRS Observations: We require all 4 MIRI MRS channels to cover the wavelengths of expected spectral features. We will use the FULL subarray and the FASTR1 readout pattern with a 4-point dither pattern. Each observation also includes a nod off scene with the aperture centered on the source for background subtraction. Target acquisition for MRS observations was deemed unnecessary following relevant JWST strategy documentation. We will obtain simultaneous imaging to improve the MRS data astrometry accuracy using the FASTR1 readout mode and the F560W filter.

LRS Observations: We will use LRS slit mode with the ALONG SLIT NOD dither pattern and the FASTR1 readout mode. We do not require dedicated background observations for point sources in LRS mode, following JWST documentation. Target acquisition is recommended for point sources in slit mode, and we will obtain a TA verification image using the F560W filter with 4 groups for all targets, except 23871 which uses the FND filter.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(3)	623	TYPE=ASTEROID,A=2.460802846238539,E=0.1132943016148617,I=14.12640890660576,O=308.3385228221355,W=124.4525498165079,M=148.3427425240759,EQUINOX=J2000,EPOCH=05-MAR-2016:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				
(4)	623-background	TYPE=ASTEROID,A=2.460802846238539,E=0.1132943016148617,I=14.12640890660576,O=308.3385228221355,W=124.4525498165079,M=148.3427425240759,EQUINOX=J2000,EPOCH=05-MAR-2016:00:00:00,EpochTimeScale=TDB	TYPE=POS_ANGLE,RAD=300,ANG=0,REF=NORTH	
Comments: Extended=NO				
(5)	10253	TYPE=ASTEROID,A=2.295795471304032,E=0.1502661942457585,I=0.3795474114409044,O=53.32556205176729,W=63.54421945391935,M=344.0643004622001,EQUINOX=J2000,EPOCH=29-MAR-2016:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				
(6)	13294	TYPE=ASTEROID,A=2.257626947268276,E=0.09808906970818912,I=5.733615928502086,O=48.77794976356908,W=148.6308442898535,M=310.5517312756758,EQUINOX=J2000,EPOCH=09-MAR-2017:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				
(7)	23871	TYPE=ASTEROID,A=2.384256896771158,E=0.2218819534194632,I=4.994259312677268,O=149.181216011864,W=131.0380215306863,M=27.52893523944858,EQUINOX=J2000,EPOCH=22-OCT-2016:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				
(8)	59980	TYPE=ASTEROID,A=3.053577458579256,E=0.03003962917062432,I=11.73547519803875,O=142.813714610798,W=298.6077780584588,M=23.20814639341693,EQUINOX=J2000,EPOCH=09-APR-2017:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				
(9)	88055	TYPE=ASTEROID,A=2.73337828282322,E=0.1036430524470154,I=6.736449606549081,O=106.2320150677626,W=267.9869294334871,M=264.2441484096522,EQUINOX=J2000,EPOCH=11-APR-2017:00:00:00,EpochTimeScale=TDB		
Comments: Extended=NO				

Observation

Proposal 12108, Observation 3: Chimaera

Fri Mar 13 23:01:58 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[Chimaera background (Obs 4)]

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Chimaera (Obs 3)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(3)	623	TYPE=ASTEROID,A=2.460802846238539,E=0.1132943016148617,I=14.12640890660576,O=308.3385228221355,W=124.4525498165079,M=148.3427425240759,EQUINOX=J2000,EPOCH=05-MAR-2016:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

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	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	Optional ETC ID
1		IMAGER	F770W	FASTR1	9	4	1	Dither 1	4	16	432.906	277635
1	SHORT(A)	MRSLONG		FASTR1	9	4	1	Dither 1	4	16	432.906	277635
1	SHORT(A)	MRSSHORT		FASTR1	19	2	1	Dither 1	4	8	432.906	277635
2		IMAGER	F770W	FASTR1	9	4	1	Dither 1	4	16	432.906	277635
2	MEDIUM(B)	MRSLONG		FASTR1	9	4	1	Dither 1	4	16	432.906	277635
2	MEDIUM(B)	MRSSHORT		FASTR1	13	3	1	Dither 1	4	12	455.107	277635
3		IMAGER	F770W	FASTR1	5	2	1	Dither 1	4	8	122.102	277635
3	LONG(C)	MRSLONG		FASTR1	5	2	1	Dither 1	4	8	122.102	277635
3	LONG(C)	MRSSHORT		FASTR1	10	1	1	Dither 1	4	4	111.002	277635

Special Requirements	
	Sequence Observations 3, 4, Non-interruptible DEFAULT WINDOW: ANGULAR RATE 623 FROM JWST LESS THAN 0.075

Observation

Proposal 12108, Observation 4: Chimaera background

Fri Mar 13 23:01:58 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [Chimaera (Obs 3)]

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Chimaera background (Obs 4)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(4)	623-background	TYPE=ASTEROID,A=2.460802846238539,E=0.1132943016148617,I=14.12640890660576,O=308.3385228221355,W=124.4525498165079,M=148.3427425240759,EQUINOX=J2000,EPOCH=05-MAR-2016:00:00:00,EpochTimeScale=TDB	TYPE=POS_ANGLE,RAD=300,ANG=0,REF=NORTH	

Comments: Extended=NO

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	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	Optional ETC ID
1		IMAGER	F770W	FASTR1	9	4	1	None	1	4	108.227	277635
1	SHORT(A)	MRSLONG		FASTR1	9	4	1	None	1	4	108.227	277635
1	SHORT(A)	MRSSHORT		FASTR1	19	2	1	None	1	2	108.227	277635
2		IMAGER	F770W	FASTR1	9	4	1	None	1	4	108.227	277635
2	MEDIUM(B)	MRSLONG		FASTR1	9	4	1	None	1	4	108.227	277635
2	MEDIUM(B)	MRSSHORT		FASTR1	13	3	1	None	1	3	113.777	277635
3		IMAGER	F770W	FASTR1	5	2	1	None	1	2	30.525	277635
3	LONG(C)	MRSLONG		FASTR1	5	2	1	None	1	2	30.525	277635
3	LONG(C)	MRSSHORT		FASTR1	10	1	1	None	1	1	27.75	277635

Special Requirements	
	Sequence Observations 3, 4, Non-interruptible DEFAULT WINDOW: ANGULAR RATE 623-background FROM JWST LESS THAN 0.075

Observation

Proposal 12108, Observation 5: 10253

Fri Mar 13 23:01:58 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(10253 (Obs 5)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(5)	10253	TYPE=ASTEROID,A=2.295795471304032,E=0.1502661942457585,I=0.3795474114409044,O=53.32556205176729,W=63.54421945391935,M=344.0643004622001,EQUINOX=J2000,EPOCH=29-MAR-2016:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	5 10253	F560W	FAST	4	1	1	11.1	277635

Template

Subarray	Obtain Verification Image?
FULL	false

Dithers

#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset
1	ALONG SLIT NOD				

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	Optional ETC ID
1	FASTR1	54	1	2	1	2	299.704	277635

Special Requirements	DEFAULT WINDOW: ANGULAR RATE 10253 FROM JWST LESS THAN 0.075

Observation

Proposal 12108, Observation 6: 13294

Fri Mar 13 23:01:58 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(13294 (Obs 6)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(6)	13294	TYPE=ASTEROID,A=2.257626947268276,E=0.0980 8906970818912,I=5.733615928502086 ,O=48.77794976356908,W=148.6308442898535,M=3 10.5517312756758,EQUINOX=J2000,EPOCH=09-MAR-2017:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	6 13294	F560W	FAST	4	1	1	11.1	277635

Template

Subarray	Obtain Verification Image?
FULL	false

Dithers

#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset
1	ALONG SLIT NOD				

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	Optional ETC ID
1	FASTR1	16	1	2	1	2	88.801	277635

Special Requirements	DEFAULT WINDOW: ANGULAR RATE 13294 FROM JWST LESS THAN 0.075

Observation

Proposal 12108, Observation 7: 23871

Fri Mar 13 23:01:58 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(23871 (Obs 7)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(7)	23871	TYPE=ASTEROID,A=2.384256896771158,E=0.2218819534194632,I=4.994259312677268,O=149.181216011864,W=131.0380215306863,M=27.52893523944858,EQUINOX=J2000,EPOCH=22-OCT-2016:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	7 23871	FND	FAST	4	1	1	11.1	277635

Template

Subarray	Obtain Verification Image?
FULL	false

Dithers

#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset
1	ALONG SLIT NOD				

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	Optional ETC ID
1	FASTR1	5	5	10	1	2	160.952	277635

Special Requirements	DEFAULT WINDOW: ANGULAR RATE 23871 FROM JWST LESS THAN 0.075

Observation

Proposal 12108, Observation 8: 59980

Fri Mar 13 23:01:58 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(59980 (Obs 8)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(8)	59980	TYPE=ASTEROID,A=3.053577458579256,E=0.0300 3962917062432,I=11.73547519803875 ,O=142.813714610798,W=298.6077780584588,M=23. 20814639341693,EQUINOX=J2000,EPOCH=09-APR-2017:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	8 59980	F560W	FAST	4	1	1	11.1	277635

Template

Subarray	Obtain Verification Image?
FULL	false

Dithers

#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset
1	ALONG SLIT NOD				

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	Optional ETC ID
1	FASTR1	17	1	2	1	2	94.351	277635

Special Requirements	DEFAULT WINDOW: ANGULAR RATE 59980 FROM JWST LESS THAN 0.075

Observation

Proposal 12108, Observation 9: 88055

Fri Mar 13 23:01:58 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Visit 9:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(88055 (Obs 9)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(9)	88055	TYPE=ASTEROID,A=2.73337828282322,E=0.10364 30524470154,I=6.736449606549081 ,O=106.2320150677626,W=267.9869294334871,M=2 64.2441484096522,EQUINOX=J2000,EPOCH=11-APR-2017:00:00:00,EpochTimeScale=TDB		

Comments: Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	9 88055	F560W	FAST	4	1	1	11.1	277635

Template

Subarray	Obtain Verification Image?
FULL	false

Dithers

#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset
1	ALONG SLIT NOD				

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	Optional ETC ID
1	FASTR1	21	1	2	1	2	116.552	277635

Special Requirements	DEFAULT WINDOW: ANGULAR RATE 88055 FROM JWST LESS THAN 0.075