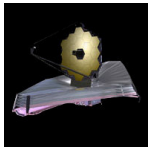

6743 - Understanding Little Red Dots with ALMA and MIRI

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Meghana Killi (PI)	**Diego Portales University**
Mr. Manuel Solimano - Diego Portales University (CoI)	Diego Portales University
Dr. Tanio Diaz-Santos (CoI) (ESA Member)	FORTH - Institute of Astrophysics
Dr. Gabriel Brammer (CoI) (ESA Member)	University of Copenhagen, Niels Bohr Institute
Dr. Darach Watson (CoI) (ESA Member)	University of Copenhagen, Niels Bohr Institute
Dr. Kasper Elm Heintz (CoI) (ESA Member)	University of Copenhagen, Niels Bohr Institute
Belen Alcalde Pampliega (CoI) (ESA Member)	European Southern Observatory - Chile
Dr. Roberto Assef (CoI)	Diego Portales University
Dr. Chiara Giulia Mazzucchelli (CoI)	Diego Portales University
Vadim Rusakov (CoI) (ESA Member)	Cosmic Dawn Center, Niels Bohr Institute
Mr. Albert Sneppen (CoI) (ESA Member)	University of Copenhagen, Niels Bohr Institute
Dr. Francesco Maria Valentino (CoI) (ESA Member)	European Southern Observatory - Germany
Dr. Francesca Rizzo (CoI) (ESA Member)	Cosmic Dawn Center, Niels Bohr Institute

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	MIRI_UNCOVER_4286_13821	MIRI Imaging	(7) UNCOVER_4286_13821
	2	MIRI_UNCOVER_38108	MIRI Imaging	(3) UNCOVER_38108
	3	MIRI_UNCOVER_45924	MIRI Imaging	(4) UNCOVER_45924
	4	MIRI_J0100-15157	MIRI Imaging	(5) J0100-15157

ABSTRACT

Partner Observatory (ALMA) ID: 2024.1.01091.S

Little Red Dots (LRDs), discovered last year with JWST are a population of objects with a compact and red-coloured optical morphology and v-shaped spectral energy distributions (SEDs)/spectra. Multiple theories exist to explain the nature of these enigmatic sources, with debate as to whether the unusual continuum shape can be reproduced by an AGN alone or if it requires a hybrid galaxy+AGN model. We target 5 of the brightest LRDs that are accessible to both ALMA and JWST, and propose a joint ALMA+JWST observation to answer this question, by sampling both the mid- and far-infrared emission of these objects for the first time. We aim to measure the mid-infrared colour with JWST/MIRI around rest-frame 2-3um where the hot dust emission from an AGN would be detected if it exists. We also aim to detect the [CII] 158um line and the underlying dust continuum with ALMA, which will not only place constraints on the FIR slope, but also help us estimate gas and dust properties, obscured star-formation if any, and accurate stellar masses and AGN luminosities.

OBSERVING DESCRIPTION

We propose to observe five little red dots with MIRI to map their spectral energy distributions in this wavelength range, and thereby determine whether these objects host active galactic nucleii (AGN). We intend to measure the mid-infrared colour around rest-frame 2-3um for all five targets in order to sample the hot dust emission from the AGN, if present. We therefore request MIRI imaging in two bands per source, either F1280W and F1800W (for UNCOVER 38108 and J0100-15157), or F1500W and F1800W (for UNCOVER 4286 and 13821), depending on source redshift. We aim to achieve an SNR of at least 5 for these targets in ~30-60 minutes per source per band. UNCOVER-4286 and UNCOVER-13821 are grouped together under the same target to optimise observations. For UNCOVER 45924, we request observation in the F2100W band in addition to F1280W and F1800W, as it is very bright, and can be observed with an SNR of ~13-22 in a total of ~8 minutes on source in all three bands. The total time requested for all observations is 10.5 hours with MIRI.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	UNCOVER_38108	RA: 00 14 7.2020 (3.5300083d) Dec: -30 21 28.85 (-30.35801d) Equinox: J2000		
Comments: *Category=Galaxy* *Description=[High-redshift galaxies]*				
(4)	UNCOVER_45924	RA: 00 14 20.3420 (3.5847583d) Dec: -30 20 37.07 (-30.34363d) Equinox: J2000		
Comments: *Category=Galaxy* *Description=[High-redshift galaxies]*				
(5)	J0100-15157	RA: 01 00 7.2600 (15.0302500d) Dec: +28 03 0.64 (28.05018d) Equinox: J2000		
Comments: *Category=Galaxy* *Description=[High-redshift galaxies]*				
(7)	UNCOVER_4286_13821	RA: 00 14 28.7772 (3.6199050d) Dec: -30 24 41.80 (-30.41161d) Equinox: J2000		
Comments: This target includes two sources UNCOVER 4286 and UNCOVER 13821. *Category=Galaxy* *Description=[High-redshift galaxies]*				

Observation

Proposal 6743, Observation 1: MIRI_UNCOVER_4286_13821

Wed Aug 21 18:00:44 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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
(7)	UNCOVER_4286_13821	RA: 00 14 28.7772 (3.6199050d) Dec: -30 24 41.80 (-30.41161d) Equinox: J2000		

Comments: This target includes two sources UNCOVER 4286 and UNCOVER 13821.
Category=Galaxy
Description=[High-redshift galaxies]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	9						SMALL
2	CYCLING	1	25						SMALL

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1500W	FASTR1	100	1	1	Dither 1	9	9	2497.536	
2	F1800W	FASTR1	50	1	1	Dither 2	25	25	3468.8	

Special Requirements

Aperture PA Range 131.63544897 to 236.43544897 Degrees (V3 126.8 to 231.6)
Aperture PA Range 312.83544897 to 55.33544897 Degrees (V3 308.0 to 50.5)

Group Observations 1, 2, 3, Non-interruptible

Observation

Proposal 6743, Observation 2: MIRI_UNCOVER_38108 Wed Aug 21 18:00:45 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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
(3)	UNCOVER_38108	RA: 00 14 7.2020 (3.5300083d) Dec: -30 21 28.85 (-30.35801d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[High-redshift galaxies]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	6						SMALL
2	CYCLING	1	25						SMALL

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1280W	FASTR1	100	1	1	Dither 1	6	6	1665.024	
2	F1800W	FASTR1	50	1	1	Dither 2	25	25	3468.8	

Special Requirements

Group Observations 1, 2, 3, Non-interruptible

Observation

Proposal 6743, Observation 3: MIRI_UNCOVER_45924

Wed Aug 21 18:00:45 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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
(4)	UNCOVER_45924	RA: 00 14 20.3420 (3.5847583d) Dec: -30 20 37.07 (-30.34363d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[High-redshift galaxies]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	6						SMALL
2	CYCLING	1	25						SMALL
3	CYCLING	1	3						SMALL

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1280W	FASTR1	10	1	1	Dither 3	3	3	83.251	
2	F1800W	FASTR1	10	1	1	Dither 3	3	3	83.251	
3	F2100W	FASTR1	20	1	1	Dither 1	6	6	333.005	

Special Requirements

Group Observations 1, 2, 3, Non-interruptible

Observation

Proposal 6743, Observation 4: MIRI_J0100-15157 Wed Aug 21 18:00:45 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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
(5)	J0100-15157	RA: 01 00 7.2600 (15.0302500d) Dec: +28 03 0.64 (28.05018d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[High-redshift galaxies]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	6						SMALL
2	CYCLING	1	20						SMALL

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1280W	FASTR1	100	1	1	Dither 1	6	6	1665.024	
2	F1800W	FASTR1	50	1	1	Dither 2	20	20	2775.04	