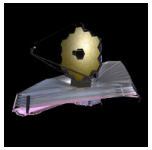

6761 - Of Dust and Dots: ALMA's View of the Brightest of JWST's Little Red Dots

Cycle: 3, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MIRI				
	1	MIRI 1000 and 2100	MIRI Imaging	(1) 45924

ABSTRACT

ALMA Proposal 2024.1.00826.S: One of the most surprising early JWST findings is a high abundance of Little Red Dots - very red and compact 3<z<8 sources seen in ~5% of all high-z galaxies over all JWST imaging fields. These sources must contain either significant obscured star formation or a dust-reddened AGN, and indeed many have spectroscopically-confirmed broad emission lines typical of AGN. Unlike most AGN, however, the little red dots show little evidence of AGN at any other wavelength including the X-ray and mid- IR. To solve this mystery requires substantially better constraints in the far-IR than currently exist -- the range in possible dust temperatures and the origin of the dust emission is completely unknown. We propose an in- depth study targeting the two little red dots with the best-quality existing data from ALMA and JWST to measure the total bolometric luminosity, constrain the dust temperature, and independently check the star formation rates of these enigmatic objects. These observations offer a comprehensive understanding of two archetypical little red dots that will guide all future ALMA campaigns targeting this new unusual population.

OBSERVING DESCRIPTION

As outlined in the scientific justification, while ALMA is the primary request in this program, the ALMA data alone cannot rule out all of the degeneracies between the possible far-infrared SEDs. Mid-infrared imaging from MIRI would allow us to constrain the hot dust content (if any) and provides the lever arm needed in combination with ALMA to understand the dust temperature and power source (see Figure 2). With MIRI data already in hand for RUBIES-1, we request MIRI imaging at F1000W and F2100W, similar rest-frame wavelengths to the data w already have for RUBIES-1 that allow us to constrain both the mid-infrared color and magnitude at >5micron restframe. To detect the faintest model in each filter, we request 11 minutes for F1000W and 30 minutes for F2100W (41 minutes science time for both filters). In total this corresponds to 1.3 hours of telescope time (including overheads). Our proposed data will provides a 3 uJy (~12 sigma) and 5 uJy (~4 sigma) detection limits in each filter. We estimate these limits using the ETC assuming 0.5" radius circular apertures under low background conditions. Following the established observation strategy of the SMILES survey (Williams et al. 2023) we will use the FASTR1 readout mode and 4 dithers, with 60 groups and 150 groups per

exposure in F1000W and F2100W filters, respectively. We request that the observations be obtained during an October 21 - December 16, 2024 observation window, which corresponds to the lowest background conditions for A2744 that avoid the micrometiorite avoidance zone. We do not have a restriction on orientation. We do not request coordinated parallels. While MIRI 10um imaging will be obtained in A2744 in Cycle 3 by PID 5578 it covers a different region of the cluster and our target is completely outside the footprint. No approved programs exist targeting F2100W imaging in A2744.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	45924	RA: 00 14 20.3419 (3.5847579d) Dec: -30 20 37.07 (-30.34363d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Active galactic nuclei, High-redshift galaxies]

Observation

Proposal 6761, Observation 1: MIRI 1000 and 2100

Thu Oct 03 17:01:18 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
(1)	45924	RA: 00 14 20.3419 (3.5847579d) Dec: -30 20 37.07 (-30.34363d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Active galactic nuclei, 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	4		1	1			LARGE

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1000W	FASTR1	60	1	1	Dither 1	4	4	666.01	
2	F2100W	FASTR1	150	1	1	Dither 1	4	4	1665.024	

Special Requirements

Background Limited. Background no more than 50th percentile above minimum