16879 - A Spatially Resolved View of Star Formation in Two Luminous z>=8 Galaxies showing Prominent Dust-Continuum Emission

Cycle: 29, Proposal Category: GO

(Availability Mode: SUPPORTED)

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
11	(1) DUSTY-Z8-1	WFC3/IR	1	29-Nov-2021 12:00:16.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
12	(1) DUSTY-Z8-1	WFC3/IR	1	29-Nov-2021 12:00:17.0	yes
21	(2) DUSTY-Z8-2	WFC3/IR	1	29-Nov-2021 12:00:18.0	yes
22	(2) DUSTY-Z8-2	WFC3/IR	1	29-Nov-2021 12:00:18.0	yes

4 Total Orbits Used

ABSTRACT

The discovery of some impressively luminous galaxies in the early universe has prompted questions about how such galaxies can build up so quickly. Remarkably, luminous galaxies appear to have built up a significant amount of dust content and shine brightly in the infrared, as early as 600 Myr after the Big Bang. Yet, despite keen interest from the astronomical community, only two particularly luminous galaxies are known showing prominent dust emission at z>=8, only one of which shows a bright ISM cooling line. Clearly, a larger number of IR luminous galaxies need to be identified and characterized in detail. Fortunately, thanks to on-going observations from an ALMA large program, far-IR observations have revealed prominent dust-continuum emission in two additional UV-bright galaxies at z>~8, effectively doubling the number of such sources known in the first 650 Myr. Given the existence of only low spatial resolution imaging data of these sources from the ground, we propose for the necessary HST imaging to obtain a high spatial-resolution view of the unobscured star formation in the sources to match the far-IR view provided by ALMA, allowing for a more integration view of star formation. For better sensitivity and to provide for a resolved view of dust obscuration, two-band F125W+F160W observations are requested. One significant benefit of the proposed observations -- and a key rationale for mid-cycle time -- is this program's significantly improving prospects for detecting ISM-cooling lines in the sources thanks to the improved photometric redshift constraints.

OBSERVING DESCRIPTION

We observe 2 candidate ultrabright (mH~24.8 AB) star-forming galaxies at z>8 with dust emission detection from ALMA. These observations provide key information for an ongoing large ALMA program targeting these same sources. In particular, these observations will dramatically improve our ability to detect bright ISM cooling lines in the sources. This point was explicitly recognised and emphasised by the TAC as part of the HST Mid-cycle review, so it would be highly desirable if the observations could be executed before March 2022, when ALMA data on the sources will be collected.

To optimize the ease of scheduling, the observations for each source are split into two independent 1-orbit visits (DUSTY-z8-1_visit_1 and DUSTY-z8-1_visit_2, and DUSTY-z8-2_visit_1 and DUSTY-z8-2_visit_2, respectively). Acquisitions in each visit are shared between imaging in the F125W

(~0.37 orbit) and F160W (~0.63 orbit) bands (per-source total of ~0.7orbits in the F125W, and ~1.3orbits in the F160W band). We adopt a 4-point dither strategy in both bands, similar to the WFC3-IR-DITHER-BOX-MIN pattern, to improve spatial sampling and limit systematics from potential cosmetic defects and residual cosmic ray hits. We minimized the sampling time of each integration to pursue optimal cosmic ray rejection.

It would be highly advantageous if the DUSTY-z8-1_visit_1 and DUSTY-z8-1_visit_2 could be executed during the November 2021 - Feb 01, 2022 window, and DUSTY-z8-2_visit_1 and DUSTY-z8-2_visit_2 during the November 2021 - Feb 26, 2022 window. Execution prior to Feb 15, 2022 would be especially ideal to allow for time to request and implement changes to the ALMA scan strategy. We note that the execution of even one visit per target before March 2022 would greatly improve our ability to scan for the [CII] cooling line in the forthcoming ALMA observations.

In the event of Reduced Gyro Mode, given the current short (39sec) unused time in each orbit, our observing strategy would need minor revision to accommodate the additional ~2minutes required for the initial target acquisition.

Visit

Proposal 16879, DUSTY-z8-1_visit_1 (11) Mon Nov 29 17:00:19 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

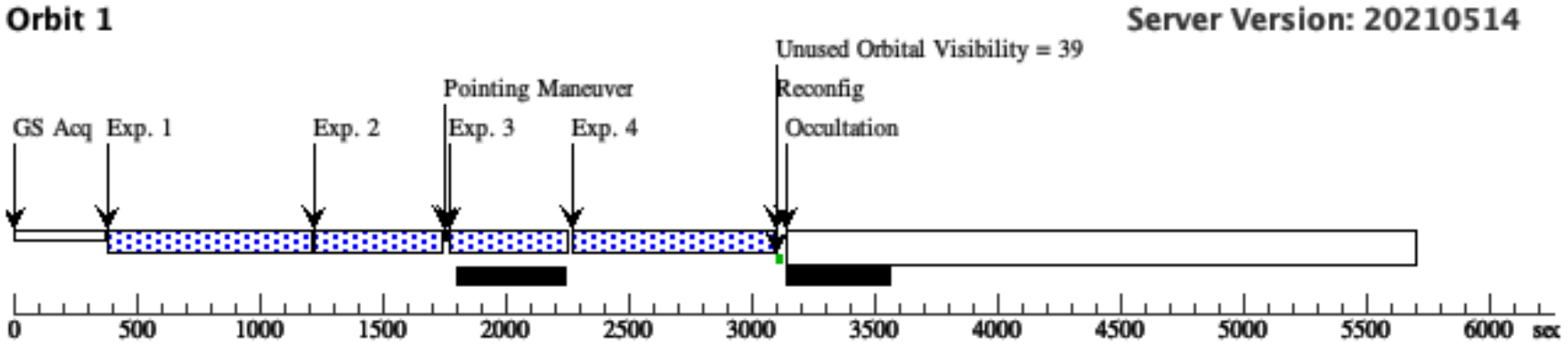
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	DUSTY-Z8-1	RA: 10 02 31.8100 (150.6325417d) Dec: +02 31 17.10 (2.52142d) Equinox: J2000		V=35.0 H~24.8	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) DUSTY-Z8-1	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS 100; NSAMP=9			802.934875 Secs (802.935 Secs) *[==>]*	*[1]*
2		(1) DUSTY-Z8-1	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS 50; NSAMP=11	SAME POS AS 1		502.936801 Secs (502.937 Secs) *[==>]*	*[1]*
3		(1) DUSTY-Z8-1	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS 50; NSAMP=10	POS TARG 0.54200 0,0.181650		452.93635 Secs (452.936 Secs) *[==>]*	*[1]*
4		(1) DUSTY-Z8-1	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS 100; NSAMP=9	SAME POS AS 3		802.934875 Secs (802.935 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 16879, DUSTY-z8-1_visit_2 (12) Mon Nov 29 17:00:19 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

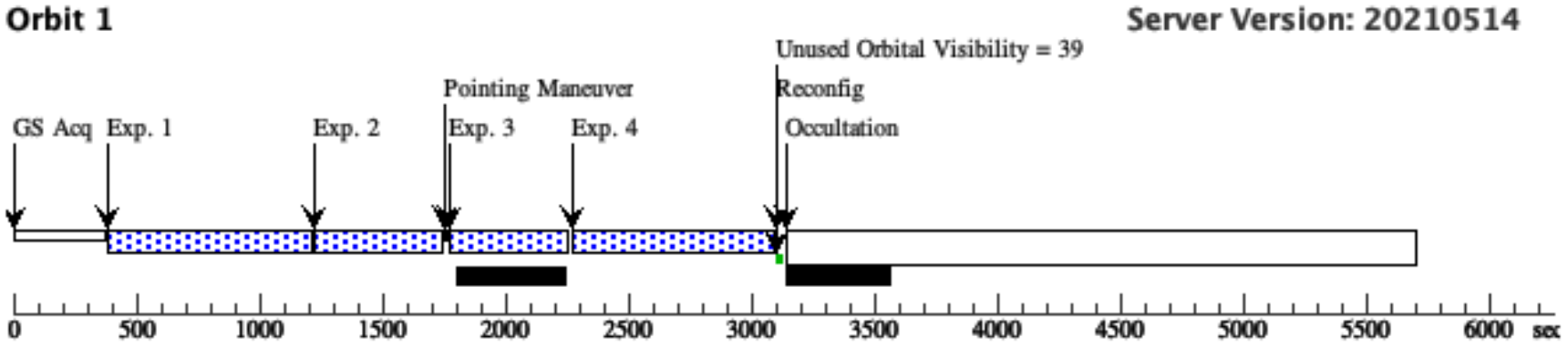
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	DUSTY-Z8-1	RA: 10 02 31.8100 (150.6325417d) Dec: +02 31 17.10 (2.52142d) Equinox: J2000		V=35.0 H~24.8	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) DUSTY-Z8-1	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS100; NSAMP=9	POS TARG 0.33875 0,0.484400		802.934875 Secs (802.935 Secs) *[==>]*	*[1]*
2		(1) DUSTY-Z8-1	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=11	SAME POS AS 1		502.936801 Secs (502.937 Secs) *[==>]*	*[1]*
3		(1) DUSTY-Z8-1	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=10	POS TARG -0.2032 50, 0.302750		452.93635 Secs (452.936 Secs) *[==>]*	*[1]*
4		(1) DUSTY-Z8-1	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS100; NSAMP=9	SAME POS AS 3		802.934875 Secs (802.935 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 16879, DUSTY-z8-2_visit_1 (21) Mon Nov 29 17:00:19 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

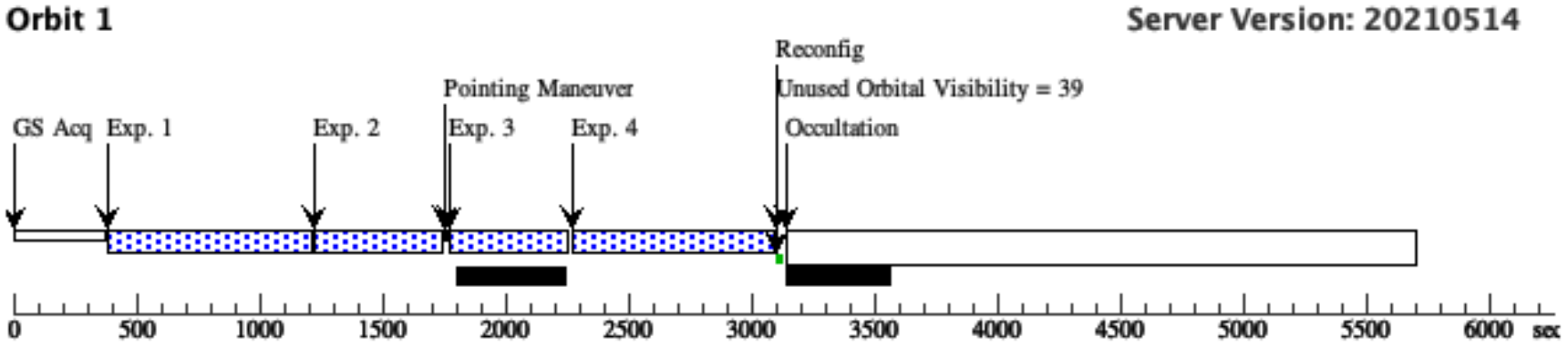
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	DUSTY-Z8-2	RA: 02 17 42.4600 (34.4269167d) Dec: -04 58 57.40 (-4.98261d) Equinox: J2000		V=35.0 H~24.8	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) DUSTY-Z8-2	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS 100; NSAMP=9			802.934875 Secs (802.935 Secs) *[==>]*	*[1]*
2		(2) DUSTY-Z8-2	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS 50; NSAMP=11	SAME POS AS 1		502.936801 Secs (502.937 Secs) *[==>]*	*[1]*
3		(2) DUSTY-Z8-2	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS 50; NSAMP=10	POS TARG 0.54200 0,0.181650		452.93635 Secs (452.936 Secs) *[==>]*	*[1]*
4		(2) DUSTY-Z8-2	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS 100; NSAMP=9	SAME POS AS 3		802.934875 Secs (802.935 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 16879, DUSTY-z8-2_visit_2 (22) Mon Nov 29 17:00:19 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	DUSTY-Z8-2	RA: 02 17 42.4600 (34.4269167d) Dec: -04 58 57.40 (-4.98261d) Equinox: J2000		V=35.0 H~24.8	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) DUSTY-Z8-2	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS100; NSAMP=9	POS TARG 0.33875 0,0.484400		802.934875 Secs (802.935 Secs) *[==>]*	*[1]*
2		(2) DUSTY-Z8-2	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=11	SAME POS AS 1		502.936801 Secs (502.937 Secs) *[==>]*	*[1]*
3		(2) DUSTY-Z8-2	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=10	POS TARG -0.2032 50, 0.302750		452.93635 Secs (452.936 Secs) *[==>]*	*[1]*
4		(2) DUSTY-Z8-2	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS100; NSAMP=9	SAME POS AS 3		802.934875 Secs (802.935 Secs) *[==>]*	*[1]*

Orbit Structure