16889 - The molecular gas mass of high-redshift HI-selected galaxies

Cycle: 29, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(2) J1626+2751-DLA	WFC3/IR	1	09-Dec-2021 13:00:12.0	yes
02	(1) J2225+0527-DLA	ACS/WFC	1	09-Dec-2021 13:00:13.0	yes

2 Total Orbits Used

ABSTRACT

HI-absorption-selected galaxies associated with damped Ly-alpha absorbers (DLAs) provide a unique opportunity to study the gas in 'typical' galaxies at high redshifts, without a luminosity bias. We have used ALMA and NOEMA to detect [CII]-158 micron or CO emission from 13 DLA galaxies at z ~ 2-4, and the JVLA to detect CO(2-1) or CO(1-0) emission from three of these galaxies. We propose to continue this successful ALMA+JVLA project, with (1) a JVLA search for CO(1-0) or CO(2-1) emission from five DLA galaxies at z~2-4 with ALMA/NOEMA detections of CO or [CII]-158 micron emission, and (2) an HST ACS/WFC3 imaging of 3 of the 5 DLA galaxies, covering the rest-frame near-UV continuum. The JVLA observations will yield molecular gas masses for all five galaxies, and CO excitation information for four systems, while the HST

observations will measure the dust-unobscured star formation rates; the combination of ALMA/NOEMA, JVLA and HST data will allow us to obtain the most complete picture of high-z DLA galaxies to date, and to directly test whether such galaxies might have been missed in emission-selected samples due to dust obscuration. We request 36.5 hours of JVLA time and 3 orbits of HST time.

OBSERVING DESCRIPTION

We aim to image 2 galaxies associated with z~4 and z~2 DLAs in the near-infrared and optical wavebands with the WFC3 and ACS cameras. The primary goal of the HST observations is a measurement of the rest-frame NUV flux from the galaxies in order to determine the unobscured SFR. The two targets were selected from a sample of DLA host galaxies which have been detected with the Atacama Large Millimeter/sub-millimeter Array, in either [CII] or CO line emission, and in the far-infrared (FIR) or sub-mm continuum. This is a joint proposal with the Very Large Array (VLA); the VLA observations will provide information on the molecular content of each DLA host through the observation of CO(2-1) or CO(1-0) emission. The goal of the HST proposal is to identify the stellar counterparts of the host galaxies, determine the morphology of the star-forming regions, quantify the dust characteristics of the galaxies by comparing the unobscured SFR with the SFR inferred from the FIR or sub-mm continuum, and directly test whether the stellar continuum, the FIR continuum, the CO emission, and the [CII] emission are co-spatial, or arise from different parts of the galaxy.

We plan to sample the rest-frame NUV of these 4 DLA galaxies with the following filters:

QSO	z_DLA	Filter
J1626+2751	4.311	WFC3/F140W
J2225+0527	2.131	ACS/F814W

For each galaxy, the filter was chosen to cover the rest-frame near-ultraviolet (NUV) emission of the galaxies, i.e. just blueward of the [OII] 3727A line and the beginning of the Balmer break at 3650 A (thus providing clean measurements of the rest-frame NUV emission of the galaxies). These measurements can be converted into reliable UV-SFR estimates using well-calibrated scaling relations (Kennicutt & Evans, 2012), and will provide precise measurements of the morphology of the star-forming regions, i.e. size, spatial distribution, signatures of clumps.

For ACS/WFC we multiply the standard four point dither position by a factor of 5 to sample different parts of the detector while maintaining the optimal sub-pixel sampling. We also place the target close to the readout to minimize CTE, and place the target on Chip 1 which has reduced read

noise over Chip 2. We note that we do not want to place the target in the corner of the chip with WFC-1 CTE, as we want to have more space around the target in case there is another galaxy nearby of interest associated with the absorber. We therefore place the target on the center of Chip 1, which has reduced read noise over Chip 2.

For the WFC3/IR dither pattern, we use the WIDE-7 pattern increased by a factor of 3 on page 17 from ISR 2016-14 by implementing POS-TARGs. For the NIR observations, we wish to stay in the linear regime and minimize persistence with our bright targets, and therefore will use SPAR25 with NSAMP of 14.

This program would not suffer from being in 1 gyro mode, as we allow any orientation making it easy to schedule. Also, there is lots of visibility in the visit planner.

Visit

Proposal 16889, J1626+2751 WFC3 (01) Thu Dec 09 18:00:13 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

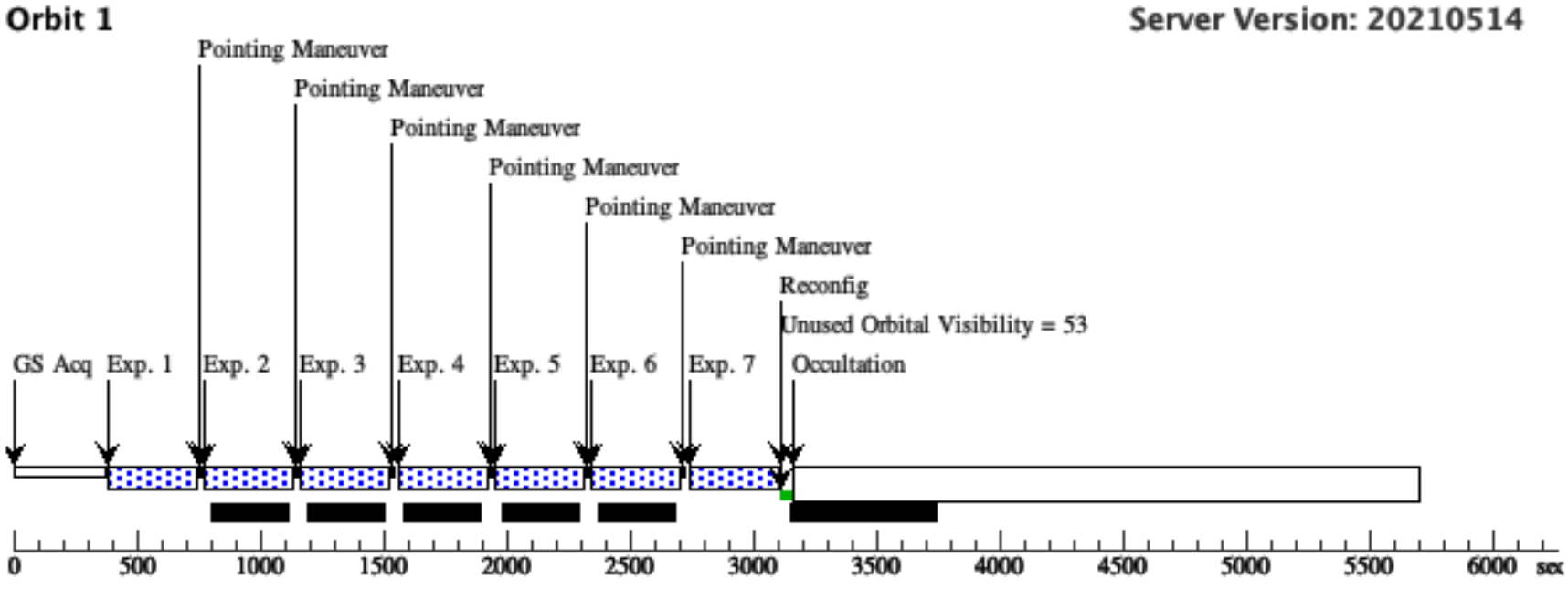
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	J1626+2751-DLA	RA: 16 26 25.8500 (246.6077083d) Dec: +27 51 35.30 (27.85981d) Equinox: J2000		V=26	Reference Frame: ICRS

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

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) J1626+2751-DLA	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=14; SAMP-SEQ=SPARS25			327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
2		(2) J1626+2751-DLA	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 2.091,0.162		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
3		(2) J1626+2751-DLA	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 4.179,0.324		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
4		(2) J1626+2751-DLA	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 0.174,1.92		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
5		(2) J1626+2751-DLA	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 2.265,2.082		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
6		(2) J1626+2751-DLA	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 4.356,1.881		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
7		(2) J1626+2751-DLA	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 1.164,3.843		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 16889, J2225+0527 ACS (02) Thu Dec 09 18:00:13 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=1.31 Line Spacing=0.96	Coordinate Frame=POS-TARG Pattern Orientation=18.39 Angle Between Sides=68.14 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J2225+0527-DLA	RA: 22 25 14.6560 (336.3110667d) Dec: +05 27 9.42 (5.45262d) Equinox: J2000		V=26	Reference Frame: ICRS

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

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) J2225+0527-DLA	ACS/WFC, ACCUM, WFC1-FIX	F814W			Pattern 1, Exps 1-1 in J2225+0527 ACS (02) (1)	516 Secs (2064 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure