15882 - The Nature of the Host Galaxies of High- Redshift Damped Lyman-alpha Absorbers

Cycle: 27, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Nissim Kanekar (PI) (Contact)	**National Centre for Radio Astrophysics, TIFR**	**nkanekar@aoc.nrao.edu**
Dr. Marcel Neeleman (CoI) (ESA Member)	Max-Planck-Institut fur Astronomie, Heidelberg	neeleman@mpia.de
Dr. Jason X. Prochaska (CoI) (AdminUSPI)	University of California - Santa Cruz	xavier@ucolick.org
Dr. Marc Rafelski (CoI) (Contact)	Space Telescope Science Institute	mrafelski@stsci.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) B1228-113-DLA	WFC3/IR	1	20-Aug-2019 14:02:01.0	yes
02	(2) J1201+2117-DLA	WFC3/IR	1	20-Aug-2019 14:02:02.0	yes
03	(3) J1054+1633-DLA	WFC3/IR	1	20-Aug-2019 14:02:03.0	yes
04	(4) B0551-366-DLA	ACS/WFC	1	20-Aug-2019 14:02:04.0	yes

4 Total Orbits Used

ABSTRACT

Absorption-selected galaxies associated with damped Ly-alpha absorbers (DLAs) provide a unique opportunity to study the gas in 'typical' galaxies at high redshifts. We have recently used ALMA to detect [CII] 158 micron or CO emission from ten DLAs at z ~ 2-4, and the VLA to detect CO(2-1) emission from one of the z~4 DLAs. We propose to continue this successful ALMA+VLA project, complementing the ALMA observations with (1)

a VLA search for CO(1-0) or CO(2-1) emission from five DLA hosts at z~2-4 with ALMA detections of CO or [CII] 158 micron emission, and (2) an HST-WFC3 imaging of 4 of the 5 DLA host galaxies with ALMA+VLA observations, covering the restframe near-UV continuum. The VLA observations will yield molecular gas masses for all five galaxies, and CO excitation information for three systems, while the HST-WFC3 observations will measure the dust-unobscured star formation rates; the combination of ALMA, VLA and HST data will allow us to obtain the most complete picture of high-z DLA host galaxies to date, and to directly test whether such galaxies might have been missed in emission selected samples due to dust obscuration. We request 32.0 hours of VLA time and 4 orbits of HST time.

OBSERVING DESCRIPTION

We aim to image 4 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 four 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
J1201+2117	3.7978	WFC3/F140W
J1054+1633	4.1346	WFC3/F160W
B0551-366	1.9622	ACS/F814W
B1228-113	2.1930	WFC3/F105W

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.

We will apply four dither positions for each of the targets. This will provide sub-pixel sampling of the PSF, and due to the multiple non-destructive reads with WFC3/IR, is ample to remove cosmic rays and create clean images. We multiply both the standard ACS/WFC dither pattern by a factor of 5 to sample different parts of the detector while maintaining the optimal sub-pixel sampling. 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 ACS pointing we place the target on Chip 1 which has reduced read noise over Chip 2. We also place the target close to the readout to minimize CTE. While we use the CTE aperture, we place the target more central in the X direction of Amplifier B. 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 15882, B1228-113 (01), implementation Tue Aug 20 18:02:05 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

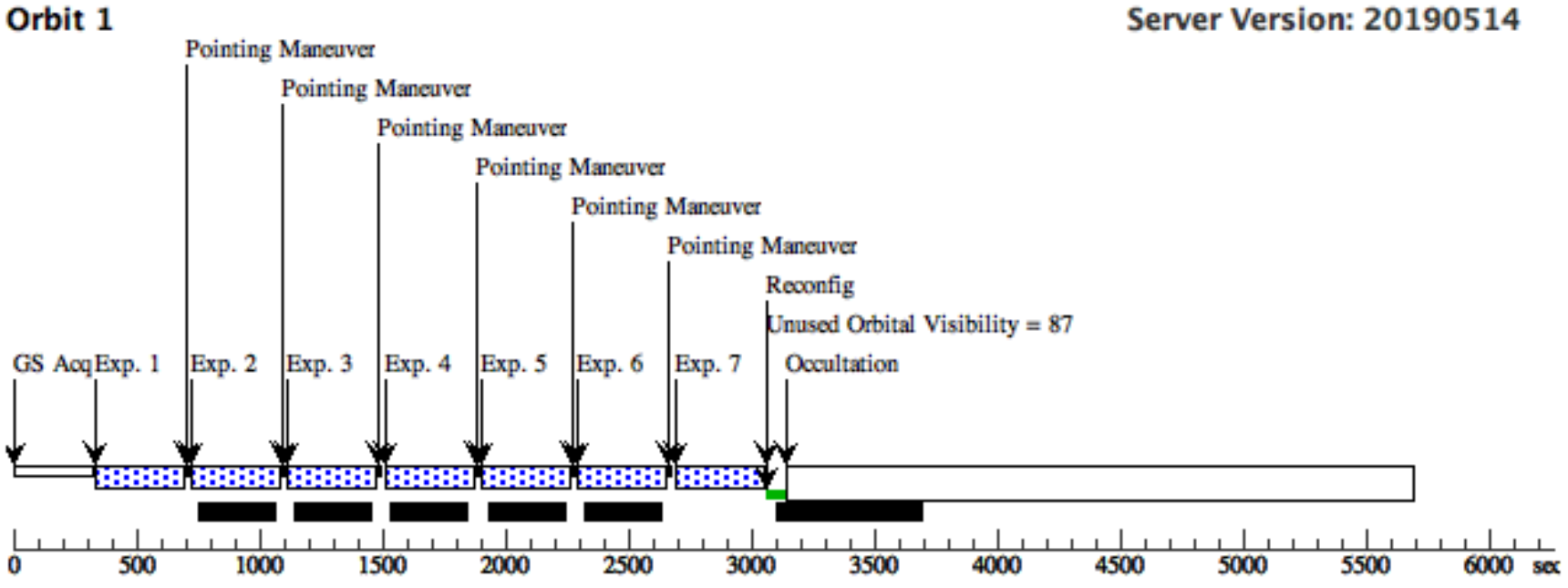
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	B1228-113-DLA	RA: 12 30 55.6200 (187.7317500d) Dec: -11 39 9.90 (-11.65275d) Equinox: J2000		V=26	Reference Frame: ICRS

Comments: V-magnitude is an estimate as no optical information is available for this galaxy
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		(1) B1228-113-DLA	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=14; SAMP-SEQ=SPARS25			327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
2		(1) B1228-113-DLA	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 2.091,0.162		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
3		(1) B1228-113-DLA	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 4.179,0.324		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
4		(1) B1228-113-DLA	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 0.174,1.92		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
5		(1) B1228-113-DLA	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 2.265,2.082		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
6		(1) B1228-113-DLA	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 4.356,1.881		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
7		(1) B1228-113-DLA	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 1.164,3.843		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15882, J1201+2117 (02), implementation Tue Aug 20 18:02:05 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

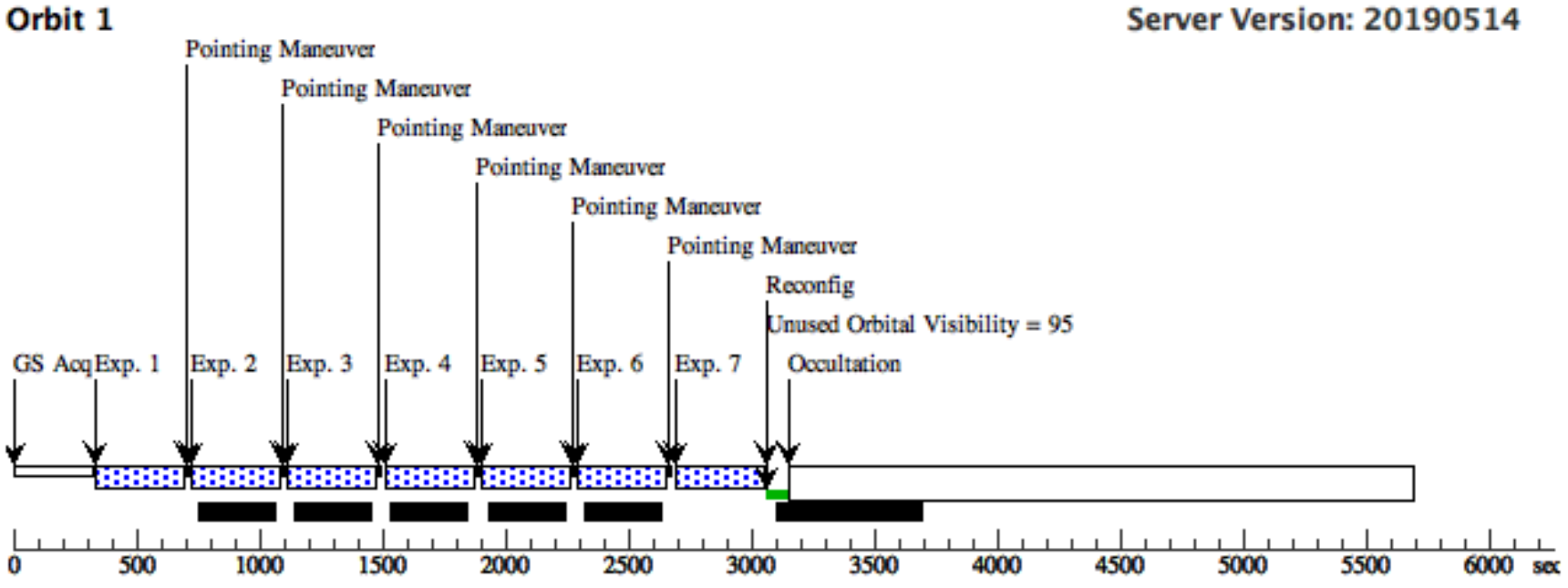
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	J1201+2117-DLA	RA: 12 01 10.2600 (180.2927500d) Dec: +21 17 56.20 (21.29894d) Equinox: J2000		V=26	Reference Frame: ICRS

Comments: V-magnitude is an estimate as no optical information is available for this galaxy
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) J1201+2117-DLA	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=14; SAMP-SEQ=SPARS25			327.938986 Secs (327.939 Secs) *[==>]*	 ***[1]***
2		(2) J1201+2117-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) J1201+2117-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) J1201+2117-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) J1201+2117-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) J1201+2117-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) J1201+2117-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 15882, J1054+1633 (03), implementation Tue Aug 20 18:02:05 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Fixed Targets

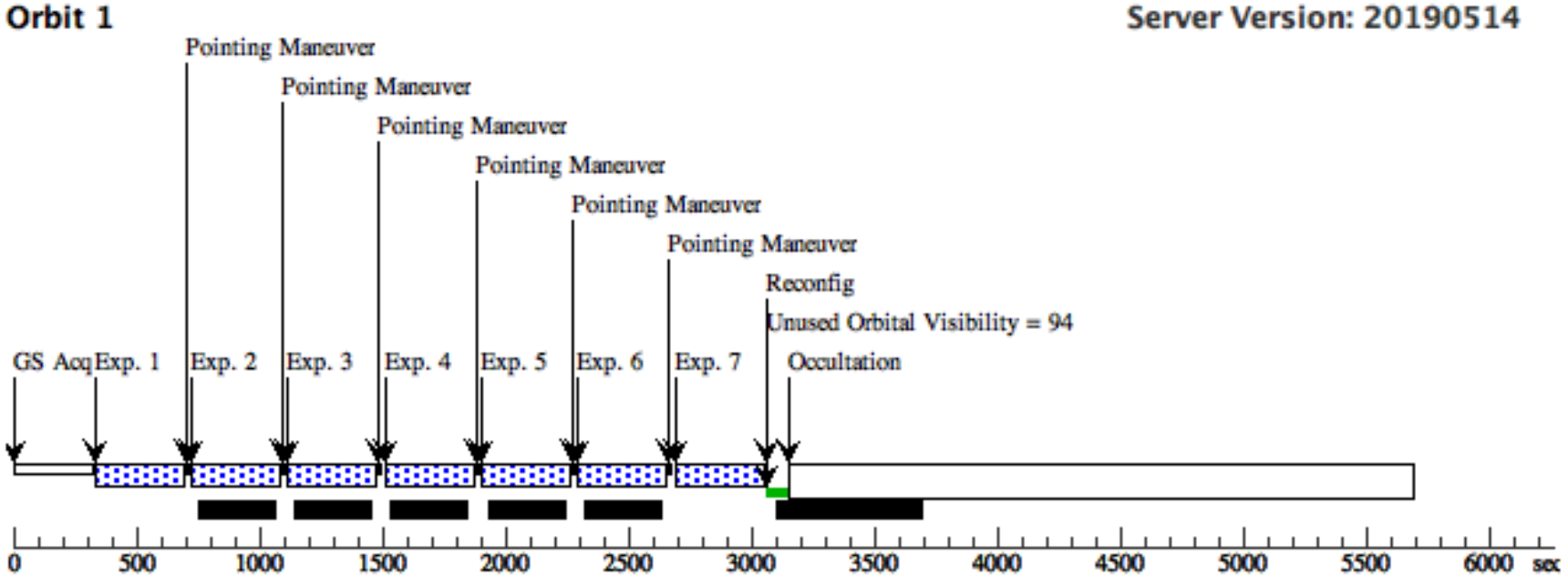
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	J1054+1633-DLA	RA: 10 54 45.4000 (163.6891667d) Dec: +16 33 37.00 (16.56028d) Equinox: J2000		V=26	Reference Frame: ICRS

Comments: V-magnitude is an estimate as no optical information is available for this galaxy
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		(3) J1054+1633-DLA	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS25			327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
2		(3) J1054+1633-DLA	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 2.091,0.162		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
3		(3) J1054+1633-DLA	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 4.179,0.324		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
4		(3) J1054+1633-DLA	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 0.174,1.92		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
5		(3) J1054+1633-DLA	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 2.265,2.082		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
6		(3) J1054+1633-DLA	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 4.356,1.881		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*
7		(3) J1054+1633-DLA	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS25	POS TARG 1.164,3.843		327.938986 Secs (327.939 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15882, B0551-366 (04), implementation Tue Aug 20 18:02:05 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	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
(4)	B0551-366-DLA	RA: 05 52 42.7044 (88.1779350d) Dec: -36 37 18.92 (-36.62192d) Equinox: J2000		V=26	Reference Frame: ICRS

Comments: V-magnitude is an estimate as no optical information is available for this galaxy
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		(4) B0551-366-DLA	ACS/WFC, ACCUM, WFC1-CTE	F814W			Pattern 2, Exps 1-1 in B0551-366 (04) (2)	542 Secs (2168 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure