16484 - First Radio Observations of the Brightest Object at z > 5

Cycle: 28, 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	(1) COOLJ1241+2219	ACS/WFC	1	02-Feb-2021 13:00:57.0	yes
02	(1) COOLJ1241+2219	ACS/WFC	1	02-Feb-2021 13:00:58.0	yes
03	(1) COOLJ1241+2219	WFC3/IR	1	02-Feb-2021 13:00:59.0	yes

3 Total Orbits Used

ABSTRACT

A recently discovered z = 5.04 lensed galaxy, COOLJ1241+2219, has an AB magnitude z = 20.5, making it is the brightest known z > 5 galaxy at OIR wavelengths by a factor of five. It is lensed by a galaxy cluster with spectroscopic z = 1.002, and a preliminary lens model indicates that the mass of that cluster core is ~10^14 solar masses. The observed rest-wavelength UV of the lensed galaxy indicates formation of massive stars in the recent past, yet an upper limit of 2 mJy/beam at 314 GHz from the SMA indicates there is little dust in a warm neutral medium. It is not, therefore, one of the usual SMG detected by millimeter-wave and FIR surveys, it is something new: a galaxy in the early Universe where star formation is

already in decline. We propose a first look of this source in the radio at the high end of the VLA Ka band, which includes the CO J=2-1 line, for three 4-hour sessions that should detect the galaxy's remaining star-forming molecular material. A three-orbit joint request to HST will provide data to refine the lens model and allow inversion of the lens to reconstruct the unlensed galaxy.

OBSERVING DESCRIPTION

The target is the brightest z>5 galaxy known. It is lensed by a foregound poor galaxy cluster at z=1, into a lensed arc. The lensing configuration suggest that a few tens of arcsecs around the lens center are of most interest, i.e. the target is extended but not large. There are no orient constraints.

Observations are one orbit in ACS in F606W, one orbit in ACS with F814W, and one orbit WFC3-IR in F110W and F160W.

For each ACS orbit we have programmed a simple 4-point dither sequence. Each exposure is 515 seconds, and the dither sequence is the standard ACS-WRFC-DITHER-BOX. No need to fill the chip gap, since the target fits readily on one chip. We have chosen the chip 2 potining aperture, because that seems to do a slightly better job of likely avoiding a star on the field edges that is in the FOV at some orients.

For the WFC3-IR orbit, we want a minimum of 4 dithered images per filter. Going to more than 4 images with reasonably balanced exposure times seemed impossible due to buffer dump contraints; hence we have programmed 4 images per filter using the WFC3-IR-DITHER-BOX-MIN pattern. We will correct for the IR blobs using a model-based flatfielding technique that we have used previously on similar data. Buffer dump contraints limit choices here: we've pushed any extra time from a simple 50/50 split into the F160W filter (which is notionally a bit slower) and used SPARS25 readout in one instance and SPARS50 in the other.

Visit

Proposal 16484, Visit 01 Tue Feb 02 18:00:59 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.262 Line Spacing=0.192	Coordinate Frame=POS-TARG Pattern Orientation=18.39 Angle Between Sides=68.14 Center Pattern=false		(1)

Fixed Targets

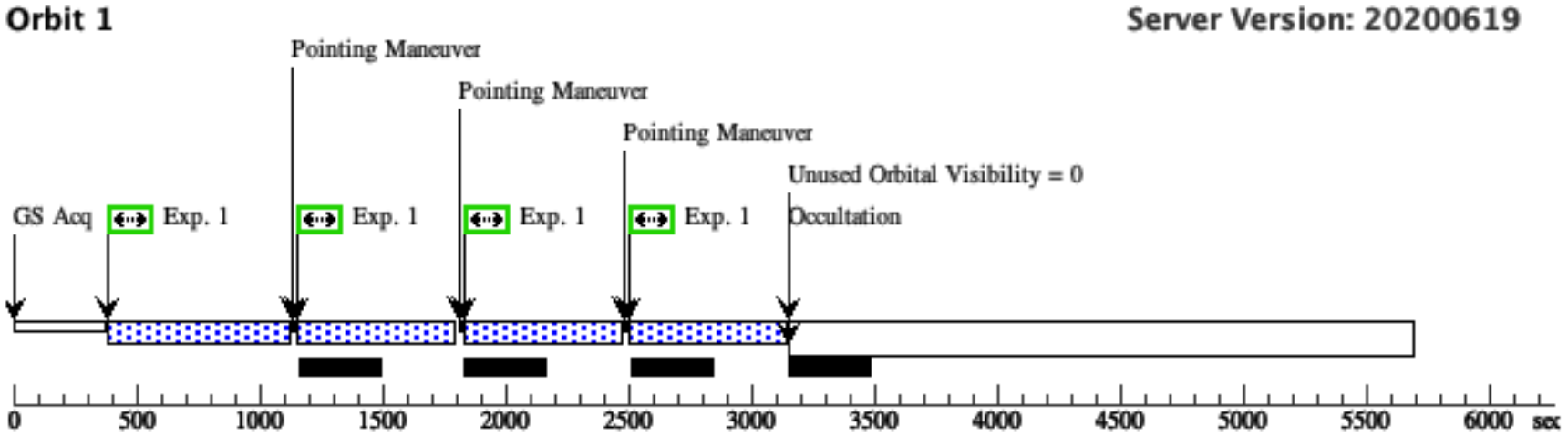
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	COOLJ1241+2219	RA: 12 41 30.0550 (190.3752292d) Dec: +22 19 46.19 (22.32950d) Equinox: J2000		V=20.5	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT CLUSTER, POOR CLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) COOLJ1241+2219	ACS/WFC, ACCUM, WFC2	F606W			Pattern 3, Exps 1-1 in Visit 01 (3)	500 Secs (2080 Secs) *[==>535.0 Secs (Pattern 1)]* *[==>515.0 Secs (Pattern 2)]* *[==>515.0 Secs (Pattern 3)]* *[==>515.0 Secs (Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 16484, Visit 02 Tue Feb 02 18:00:59 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.262 Line Spacing=0.192	Coordinate Frame=POS-TARG Pattern Orientation=18.39 Angle Between Sides=68.14 Center Pattern=false		(1)

Fixed Targets

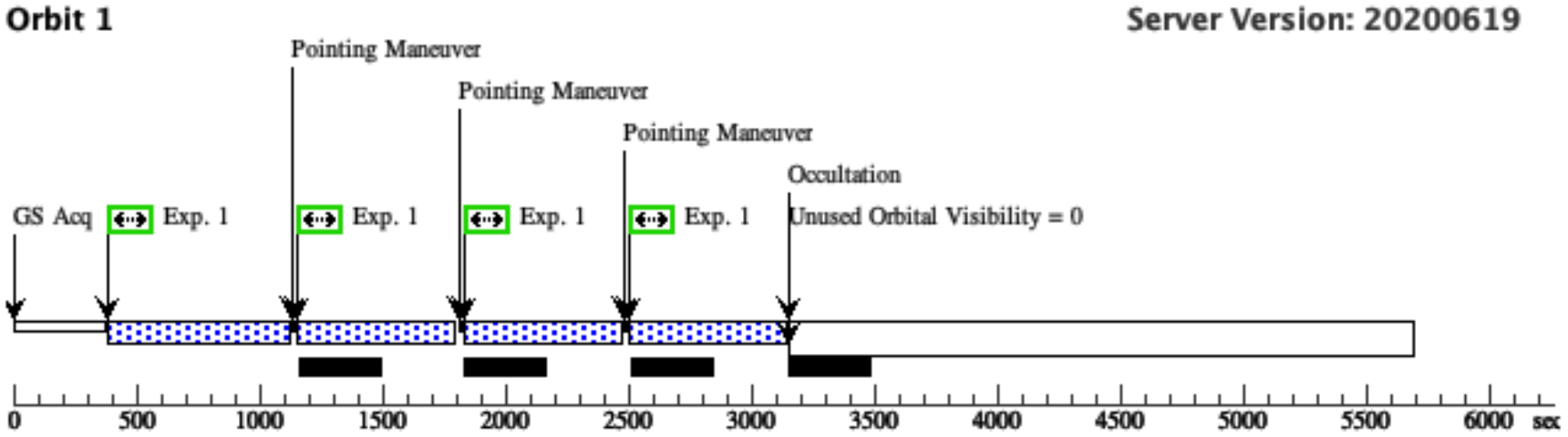
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	COOLJ1241+2219	RA: 12 41 30.0550 (190.3752292d) Dec: +22 19 46.19 (22.32950d) Equinox: J2000		V=20.5	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT CLUSTER, POOR CLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) COOLJ1241+2219	ACS/WFC, ACCUM, WFC2	F814W			Pattern 3, Exps 1-1 in Visit 02 (3)	500 Secs (2080 Secs) *[==>535.0 Secs (Pattern 1)]* *[==>515.0 Secs (Pattern 2)]* *[==>515.0 Secs (Pattern 3)]* *[==>515.0 Secs (Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 16484, Visit 03 Tue Feb 02 18:00:59 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	COOLJ1241+2219	RA: 12 41 30.0550 (190.3752292d) Dec: +22 19 46.19 (22.32950d) Equinox: J2000		V=20.5	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT CLUSTER, POOR CLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) COOLJ1241+2219	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=7; SAMP-SEQ=SPARS50		Pattern 2, Exps 1-1 in Visit 03 (2)	302.934997 Secs (1211.74 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2		(1) COOLJ1241+2219	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=11; SAMP-SEQ=SPARS25		Pattern 2, Exps 2-2 in Visit 03 (2)	252.937441 Secs (1011.75 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***

Orbit Structure