16888 - High-resolution imaging of the highest-redshift OH megamaser

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	(1) WISEAJ0330	WFC3/IR	2	28-Feb-2022 13:00:13.0	yes

2 Total Orbits Used

ABSTRACT

We propose high-resolution imaging of the OH 1667 MHz main line and 1 GHz continuum of the highest redshift known OH megamaser, which was recently discovered in early observations for the LADUMA (Looking At the Distant Universe with the MeerKAT Array) survey. As is typical in the local universe, the host system is an ultraluminous infrared galaxy; the OH emission may be tracing an outflow, but the system's possible merger status and AGN strength are uncertain. In conjunction with two orbits of HST time, our VLA observations will allow us to localize the OH emission

relative to the host galaxy's optical and radio structures, which may include multiple nuclei and/or radio jets; to determine the host galaxy's stellar morphology and its possible evolution into a post-merger elliptical; and to place stronger constraints on the OH brightness temperature, thereby informing models of physical conditions in the masing gas. The resulting analysis will place the use of spectral line surveys like LADUMA for studying the cosmic history of gas-rich mergers on a much firmer foundation.

OBSERVING DESCRIPTION

This program is using WFC3/IR to image the host galaxy of a recently discovered OH megamaser at z = 0.52. One orbit will use the medium-bandwidth F098M filter, which includes the H alpha line at this redshift, and the other orbit will use the wide-bandwidth F125W (~ J) filter, which will be used to subtract stellar continuum from the F098M image and search for low surface brightness signatures of interaction and merging. (We have not attempted to match S/N in these two images, which would optimize S/N in the difference image, since we don't know how bright the H alpha line will be, and we don't want to sacrifice too much of our sensitivity to low surface brightness features in the F125W image.) We will use the standard WFC3-IR-DITHER-BOX-MIN pattern with four positions in order to optimally sample the PSF. The field of view of interest will be well contained within the optimally sampled region, based on ground-based imaging. We estimated the target's surface brightness of 20.18 mag/arcsec^2 (Vega-relative) from ground-based imaging, which reveals a ~2" diameter source and (from the VISTA Deep Extragalactic Observations = VIDEO survey) a total magnitude J = 19.94. Due to the presence of a nearby bright star that could fall in the WFC3/IR field of view for certain roll angles, we have chosen to prioritize dynamic range by using STEP50 sequences in conjunction with the same four-point dither pattern for each filter. The first STEP50 sequence for each filter has NSAMP = 11 and will deliver four 299.232s sub-exposures; the second STEP50 sequence has NSAMP = 10 and will deliver four 249.342s sub-exposures. (It was necessary to use different NSAMP values here to avoid orbit overruns; STEP25 sequences are not practical as an alternative because they cause inconveniently timed buffer dumps.) The total integration time per object (2193.858s) should yield detection signal-to-noise ratios (in a 5x5 pixel box) of 116 and 229 for the F098M and F125 filters, respectively, based on the output of the WFC3/IR imaging ETC for an extended source with a redshifted Arp 220 spectrum (our target is a ULIRG) and nominal background conditions. These depths will ensure high signal-to-noise over the target, as required by the proposal's scientific goals. (Note: ETC runs appropriate for the two STEP50 sequences separately, reflecting lower S/N, have been included with the Phase II submission.)

Visit

Proposal 16888, Visit 01, implementation Mon Feb 28 18:00:14 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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), (3), (4)

Fixed Targets

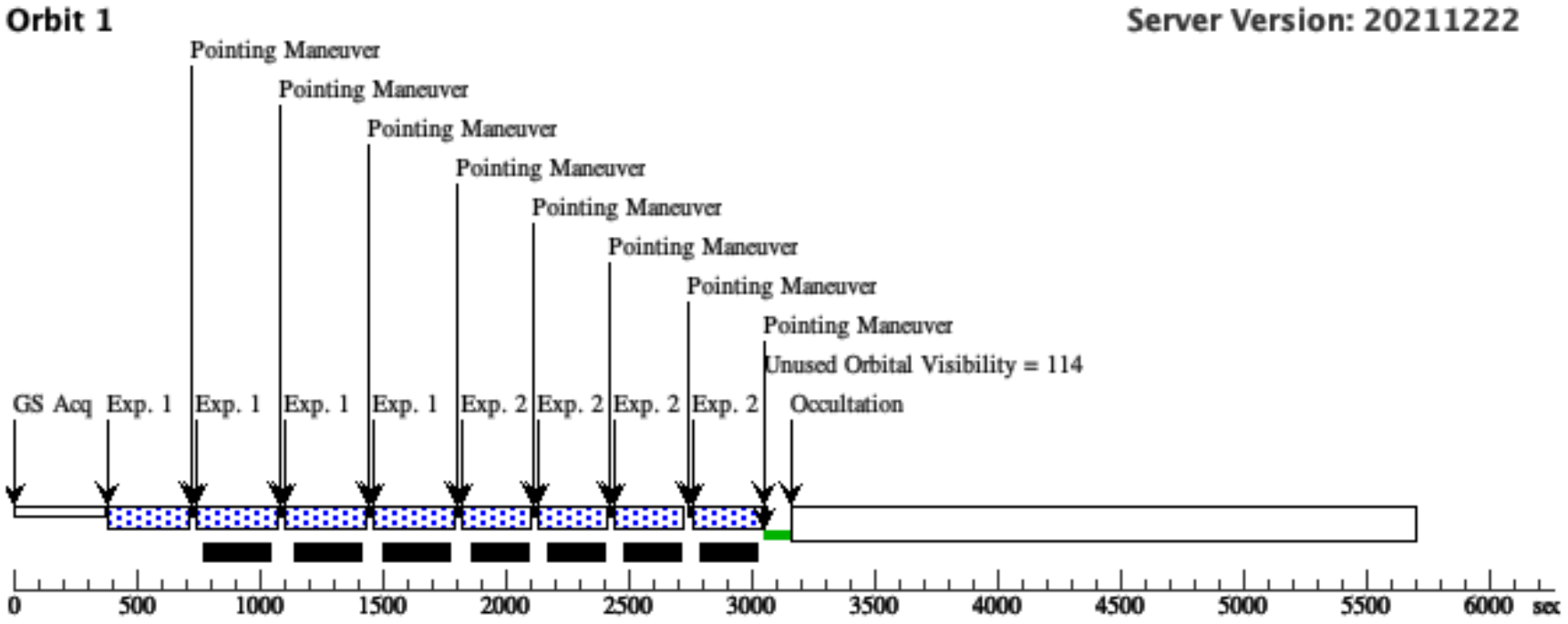
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WISEAJ0330	RA: 03 30 49.2600 (52.7052500d) Dec: -27 55 18.30 (-27.92175d) Equinox: J2000		V=21.1	Reference Frame: ICRS

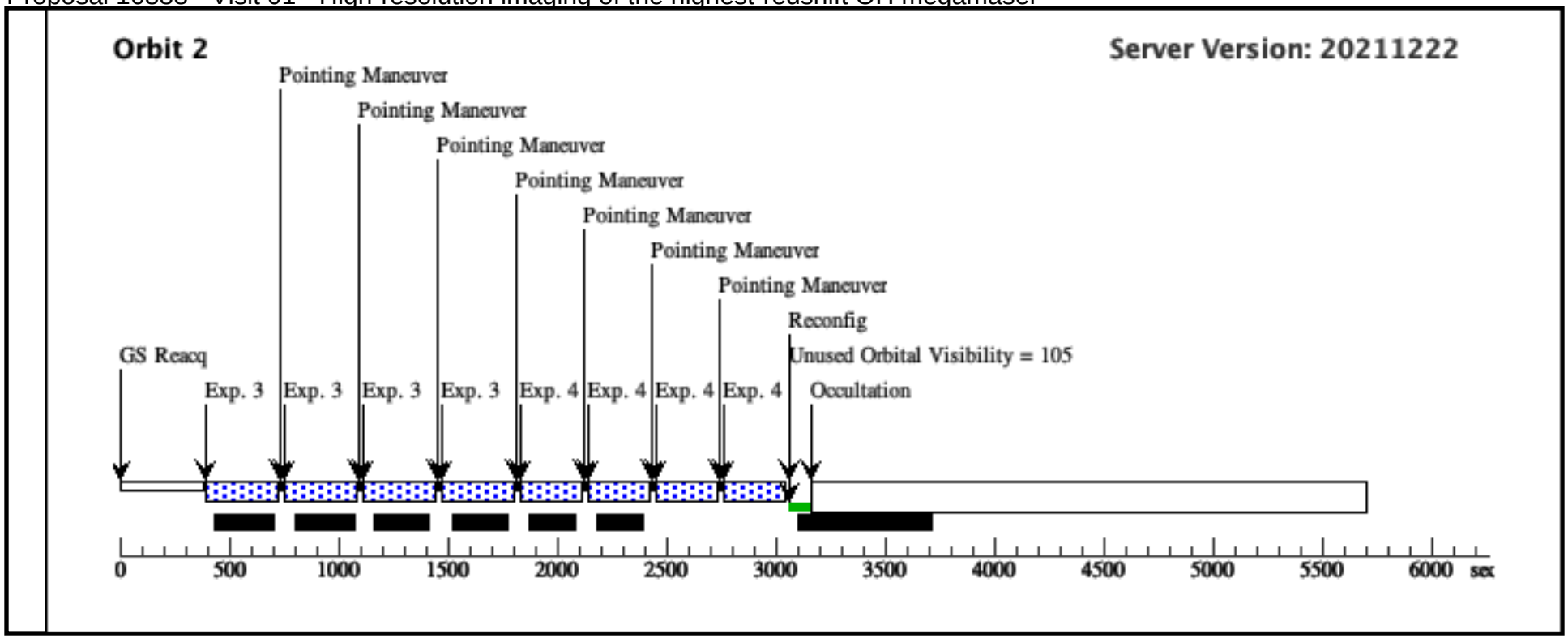
Comments: Quoted V-band magnitude is an average of g = 21.71 and r = 21.4. Near-IR magnitudesare J = 18.94, H = 18.84, K = 18.51 (Vega-relative).
Category=GALAXY
Description=[ULTRALUMINOUS IR GAL]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(WFC3IR.im.1679779)	(1) WISEAJ0330	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=STEP50; NSAMP=11		Pattern 1, Exps 1-1 in Visit 01 (1)	299.232481 Secs (1196.93 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2	(WFC3IR.im.1679777)	(1) WISEAJ0330	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=STEP50; NSAMP=10		Pattern 1, Exps 2-2 in Visit 01 (1)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
3	(WFC3IR.im.1679775)	(1) WISEAJ0330	WFC3/IR, MULTIACCUM, IR	F098M	SAMP-SEQ=STEP50; NSAMP=11		Pattern 1, Exps 3-3 in Visit 01 (1)	299.232481 Secs (1196.93 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
4	(WFC3IR.im.1679776)	(1) WISEAJ0330	WFC3/IR, MULTIACCUM, IR	F098M	SAMP-SEQ=STEP50; NSAMP=10		Pattern 1, Exps 4-4 in Visit 01 (1)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20211222
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
GS Reacq
Unused Orbital Visibility = 105
Exp. 3
Exp. 3
Exp. 3
Exp. 3
Exp. 4
Exp. 4
Exp. 4
Exp. 4
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec