17627 - Origin and Feedback of a Giant Radio Galaxy in an Extreme Protocluster at z=2.3

Cycle: 31, 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) MLAN3	WFC3/IR	1	07-Aug-2024 11:00:18.0	yes
02	(2) MLAN1	WFC3/IR	1	07-Aug-2024 11:00:18.0	yes

2 Total Orbits Used

ABSTRACT

We propose deep VLA L-band imaging in A- and B-configuration to study the environment of radio galaxy J1348+24 at z=2.3, which has 550kpc radio lobes revealed by LOFAR. J1348+24 has the largest radio lobes identified at z>2 and is embedded in a giant nebula with multiphase CGM-scale emission, including Lya and CO. J1348+24 resides in an extremely massive galaxy overdensity, which contains the densest group of enormous Lya nebulae (ELANe) ever discovered. Nevertheless, power sources of these >100 kpc Lya emissions are missing in deep optical surveys. Our proposed observations aim to: (1) resolve the origin of the highest redshift giant radio lobes and study jet-induced feedback onto the host galaxy, combining the radio imaging with HST, ALMA, and optical IFU data; (2) measure obscured star-formation or AGN activity in the ELANe using the radio/FIR correlation, unraveling their mysterious powering. The wide VLA field-of-view allows us to image all seven ELANe in the protocluster in a single pointing. Additionally, complementary HST imaging is proposed to resolve the galaxy sub-components and map jet-induced star-formation. The proposed observations will provide new insights into feedback mechanisms in massive galaxy formation and the origin of the ELANe on scales even beyond the circumgalactic medium.

OBSERVING DESCRIPTION

In this program, we obtain two orbits of WFC3-IR imaging for the radio galaxy and a few enormous Lyman-alpha nebulae located in an extreme protocluster. We plan to target two WFC3-IR pointings (visits) to cover two proposed targets (MLAN1 and MLAN3) with one-orbit integration time for each pointing. The F105W (Wide Y) band is planned to be used, which will take rest-frame UV (300 nm) wavelength for the proposed targets at redshift z=2.3. The coordinates of targets have been fine-tuned to the center of the detector, so any position angle (PA) is acceptable for both pointings. For each target, we use a standard 2-point WFC3-IR-DITHER-BLOB dither pattern and a sub-pattern of 2-point WFC3-IR-DITHER-LINE with NSAMP=13 to populate each orbit. The SPARS50 sampling sequence is used. These arrangements can make full use of each orbit, provide a half-pixel subsampling of the point-spread function (PSF) for each pointing, dither over the IR blob, and reject cosmic rays. We place target MLAN3 at the detecter optimum center (IR aperture) to observe the radio galaxy and MLAN1 at the detector geometric center (IR-FIX

aperture) to include more protocluster member galaxies.

Visit

Proposal 17627, Visit 01, implementation

Wed Aug 07 15:00:19 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	(1)

Fixed Targets

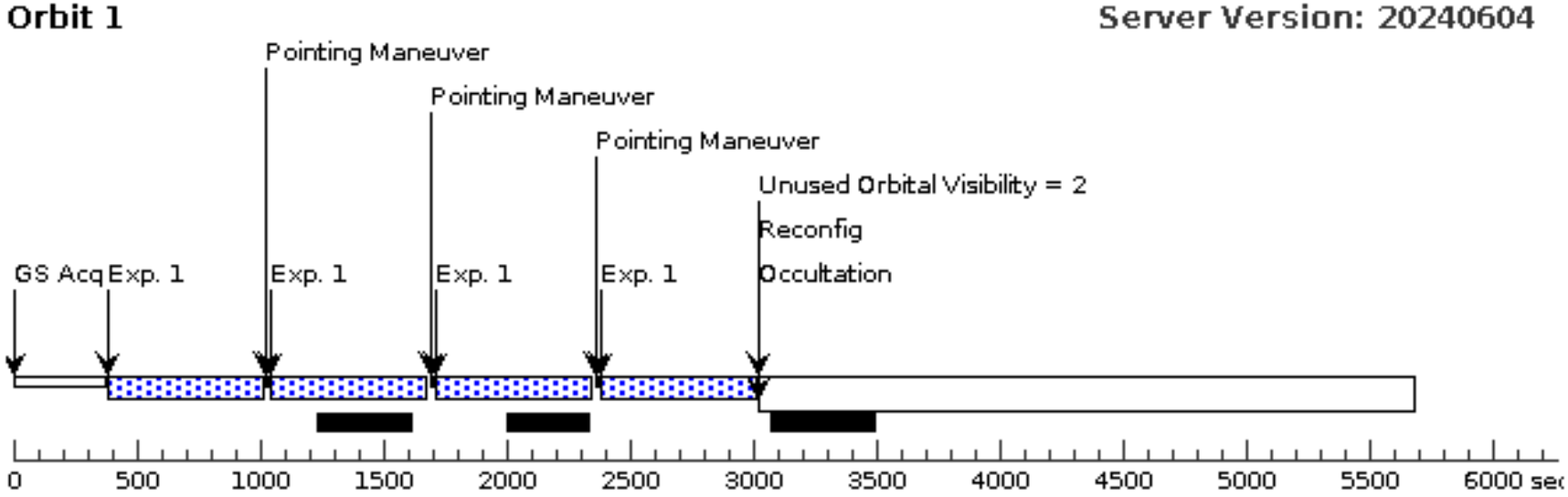
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MLAN3 Alt Name1: J1348+24	RA: 13 48 36.3100 (207.1512917d) Dec: +23 59 40.70 (23.99464d) Equinox: J2000		V=24	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY, LYMAN ALPHA CLOUD, RADIO GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) MLAN3	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=13; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 01 (1)	602.937703 Secs (2411.751 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	*[1]*

Orbit Structure



Visit

Proposal 17627, Visit 02, implementation Wed Aug 07 15:00:19 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	MLAN1 Alt Name1: IVORYNEBULA	RA: 13 47 54.5594 (206.9773308d) Dec: +23 58 17.29 (23.97147d) Equinox: J2000		V=24	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[HIGH REDSHIFT GALAXY, LYMAN ALPHA CLOUD]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) MLAN1	WFC3/IR, MULTIACCUM, IR-FIX	F105W	NSAMP=13; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 02 (1)	602.937703 Secs (2411.751 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	*[1]*

Orbit Structure