15376 - The X-ray-radio morphology anomaly in a high-redshift quasar jet

Cycle: 25, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Diana Worrall (PI) (ESA Member) (Contact)	**University of Bristol**	**d.worrall@bris.ac.uk**
Prof. Mark Birkinshaw (CoI) (ESA Member)	University of Bristol	mark.birkinshaw@bristol.ac.uk
Dr. Daniel A. Schwartz (CoI)	Smithsonian Institution Astrophysical Observatory	das@cfa.harvard.edu
Dr. Herman L. Marshall (CoI)	Massachusetts Institute of Technology	hermanm@space.mit.edu
Prof. John Wardle (CoI)	Brandeis University	wardle@brandeis.edu
Dr. Aneta Siemiginowska (CoI)	Smithsonian Institution Astrophysical Observatory	asiemiginowska@cfa.harvard.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) J1421-0643	WFC3/UVIS	1	08-Sep-2017 19:05:08.0	yes

1 Total Orbits Used

ABSTRACT

We propose a 130-ks observation with Chandra of the exceptional kpc-scale X-ray jet associated with a radio-loud quasar at redshift 3.689. This quasar was selected from a radio/X-ray archival study based on its unusual X-ray brightness and the strong difference between its X-ray and radio morphologies. The existing 3.3-ks Chandra exposure shows a ribbon-like X-ray structure offset from the radio jet, and an unusually high X-ray jet to core flux ratio. We wish to support the new Chandra observation with short JVLA and HST observations. The modeling possible from the new data will be important for the debate concerning a synchrotron or inverse Compton origin for the X-rays of high-redshift quasar jets, and should strongly constrain the source energetics.

OBSERVING DESCRIPTION

We will use one HST orbit to image quasar J1421-0643 using WFC3/UVIS to constrain the radio-to-X-ray spectrum of its unusual jet. 22.5 min of exposure with the F555W filter should detect the jet with signal/noise > 3 in 0.4 arcsec detection cells. 16.3 min of exposure with the F814W filter will provide independent confirmation of any faint structure and constrain the jet spectral index. WFC3/UVIS is preferred to ACS to avoid two bright stars in the neighbourhood of J1421-0643. We use dither patterns WFC3-UVIS-DITHER-LINE-3PT with F555W and WFC3-UVIS-DITHER-LINE with F814W to remove hot columns and cosmic rays in the data. Post-observation FLASH=2 is used to improve CTE for F814W. ORIENT is used to move the jet (which lies in position angle 0 - 35 deg from the quasar core, and extends 5 arcsec) away from the diffraction spikes and columns that might bleed charge from the quasar core. POS TARG is used to move the quasar 10 arcsec further from the chip gap so that its full environment is well imaged.

Visit

Proposal 15376, J1421-visit (01) Fri Sep 08 23:05:09 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 40D TO 85 D; ORIENT 157D TO 175 D; ORIENT 220D TO 265 D; ORIENT 337D TO 355 D

Comments: Main observation in F555W. Subsidiary/confirmation observation in F814W.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(2)
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1)

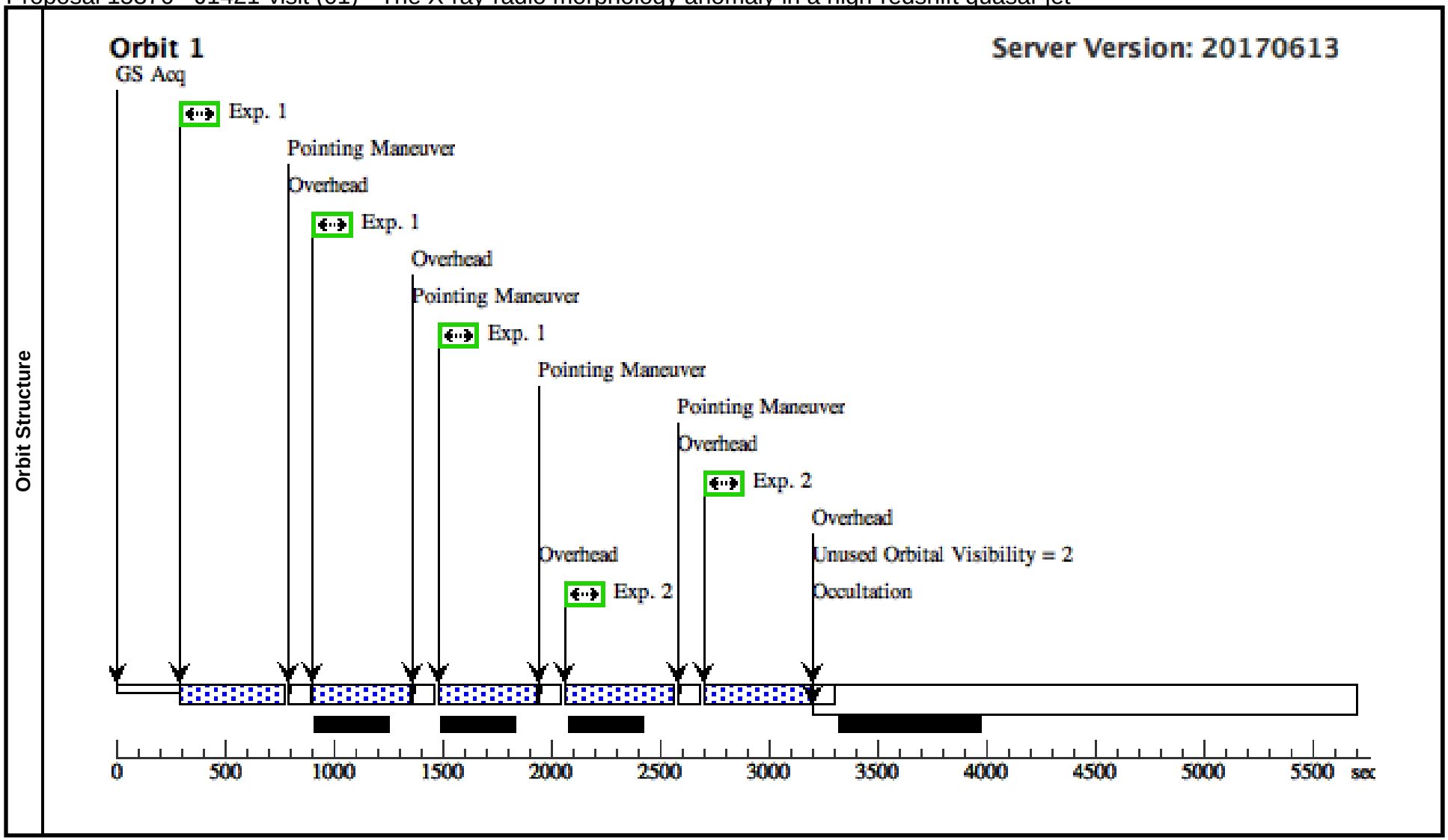
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J1421-0643	RA: 14 21 7.8000 (215.2825000d) Dec: -06 43 56.30 (-6.73231d) Equinox: J2000	Redshift: 3.689	V=18.97+/-0.04	Reference Frame: ICRS

Comments: Quasar core is point-like. Faint jet-like structure in position angle range 0 - 35 deg, extending 5 arcsec, is main target.
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J1421-f555w	(1) J1421-0643	WFC3/UVIS, ACCUM, UVIS	F555W		POS TARG null,10.0	Pattern 2, Exps 1-1 in J1421-visit (01) (2)	450 Secs (1350 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
Comments: Primary science exposure									
2	J1421-f814w	(1) J1421-0643	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=2	POS TARG null,10.0	Pattern 1, Exps 2-2 in J1421-visit (01) (1)	490 Secs (980 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
Comments: Confirmation exposure, spectral information.									


Orbit Structure
Orbit 1
Server Version: 20170613
GS Acq
Exp. 1
Pointing Maneuver
Overhead
Exp. 1
Overhead
Pointing Maneuver
Exp. 1
Pointing Maneuver
Pointing Maneuver
Overhead
Exp. 2
Overhead
Unused Orbital Visibility = 2
Occultation
Overhead
Exp. 2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec