17781 - A superluminal jet in 3C264: the view at 30

Cycle: 32, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Eileen T Meyer (PI) (Contact)	**University of Maryland Baltimore County**
Dr. Markos Georganopoulos (CoI)	University of Maryland Baltimore County
Dr. William B. Sparks (CoI)	SETI Institute
Dr. Roeland P. van der Marel (CoI)	Space Telescope Science Institute
Dr. Jay Anderson (CoI)	Space Telescope Science Institute
Dr. Marco Chiaberge (CoI) (ESA Member)	Space Telescope Science Institute - ESA - JWST
Prof. Eric S. Perlman (CoI)	Florida Institute of Technology
Dr. Onic I. Shuvo (CoI)	University of Maryland Baltimore County
Dr. Karthik Reddy Solipuram (CoI)	Arizona State University
Prof. Judd Bowman (CoI)	Arizona State University

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) 3C264	ACS/WFC	1	12-Aug-2024 14:00:46.0	yes
02	(1) 3C264	WFC3/UVIS	2	12-Aug-2024 14:00:47.0	yes

3 Total Orbits Used

ABSTRACT

3C264 is a nearby radio galaxy with a prominent optical jet. Previous HST observations from the 1990s through the 2010s discovered not only the fastest-ever superluminal speed (on kpc scales) of 7c for a knot in the jet, but also captured the motion of this knot through the start of a collision

with slow-moving material downstream, with concomitant brightening indicating in-situ particle acceleration. This remarkable discovery represents the first direct evidence for the "internal shock" model for particle acceleration, a mechanism proposed to explain variability and particle acceleration in sources as diverse as gamma-ray bursts, microquasars, and jetted AGN. The collision is expected to manifest in brightening and hardening of the optical spectrum and increasing polarization over the next several years to decade, and this unprecidented source gives us the unique opportunity to directly evaluate the applicability, efficiency and physical characterization of the internal shock mechanism.Following previous HST/VLA/Chandra observations in 2018/2019 showing a continued rise in flux and polarization in the shock region, we propose a new epoch of imaging to monitor the spectral evolution of the colliding knots and continue spatial proper motion measurements of the jet features, for comparison to the expectations from theoretical models. In keeping with past monitorig we request 2 orbits with WFC3/UVIS (near-UV, B, and I band), 1 orbit with the ACS/WFC polarizers in F606W, as well as K-band VLA and Chandra ACIS observations.

OBSERVING DESCRIPTION

Observations are of an optical jet approximately 2" long in the northeast direction, as part of a monitoring proposal for flaring behavior (this is the follow-up of an identical set of observations in 2015/16 and 2018/19). The field of view is dominated by the host galaxy, a nearby elliptical. The observations consist of two visits: the first is WFC3/UVIS imaging in three filters (F475W, F814W splitting the first orbit, F225W in the second orbit). The second visit is ACS/WFC polarimetry in F606W filter. Orient constraints are specified to avoid any risk of the central nucleus from producing diffraction spikes that run over the jet.

Visit

Proposal 17781, ACS Polariz. (01) Mon Aug 12 18:00:48 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 40D TO 85 D; ORIENT 128D TO 170 D; ORIENT 215D TO 270 D; ORIENT 305D TO 345 D

Comments: 1 orbit of ACS polarization in F606W filter. The observations cover the three polarization angle filters, with two exposures each, using a 2-point dither pattern to improve image quality and mitigate cosmic ray artifacts. Orient constraints are specified to avoid any risk of the central nucleus from producing diffraction spikes that run over the jet.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.28 Angle Between Sides= Center Pattern=false		(1), (2), (3)

Fixed Targets

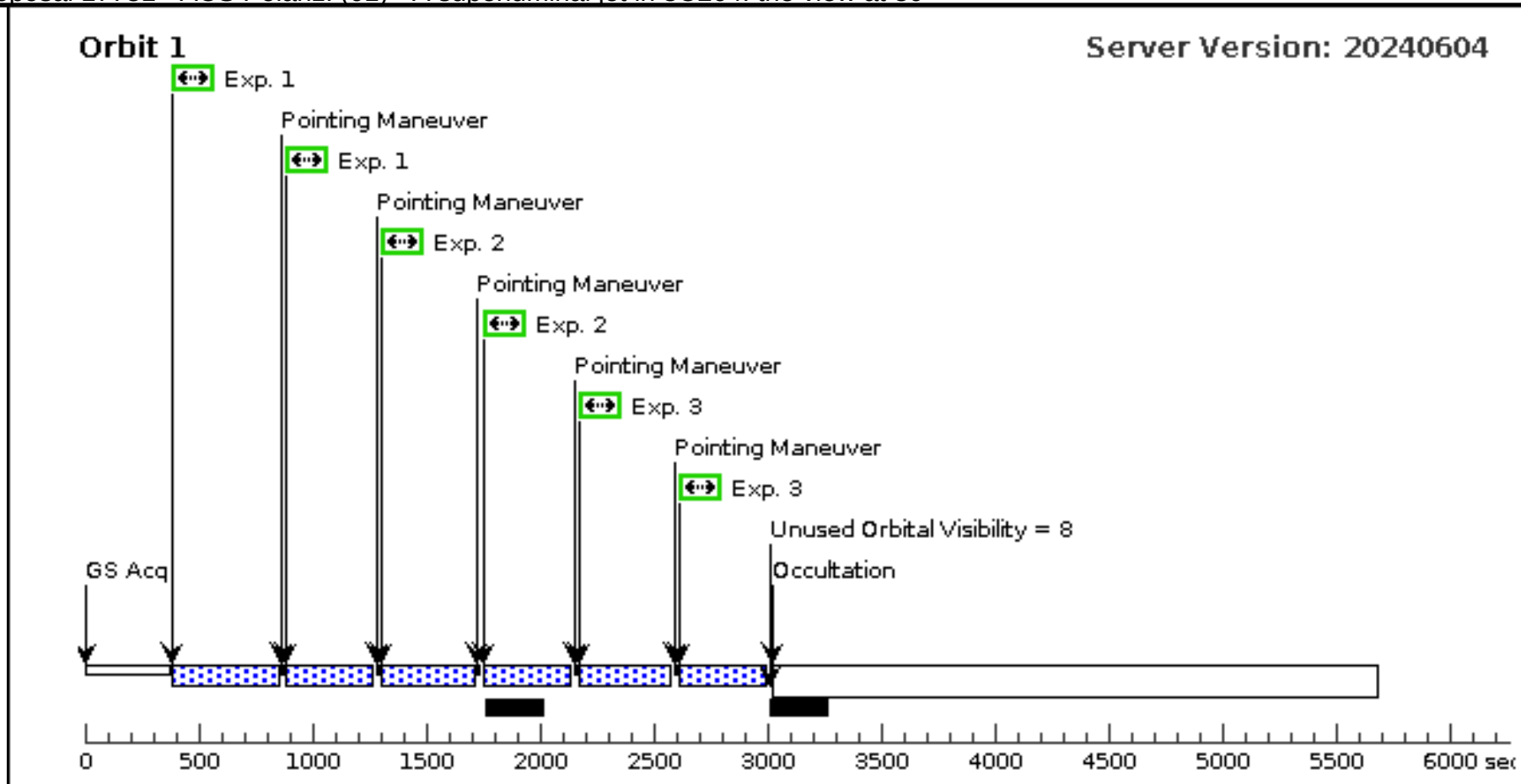
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	3C264	RA: 11 45 5.0090 (176.2708708d) Dec: +19 36 22.74 (19.60632d) Equinox: J2000		V=13.97	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[ELLIPTICAL, JET, NUCLEUS, RADIO GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) 3C264	ACS/WFC, ACCUM, WFC1	F606W POL0V		POS TARG 0,0	Pattern 3, Exps 1-1 in ACS Polariz. (01) (3)	260 Secs (520 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	 ***[1]***
2		(1) 3C264	ACS/WFC, ACCUM, WFC1	F606W POL120V		POS TARG 0,0	Pattern 3, Exps 2-2 in ACS Polariz. (01) (3)	260 Secs (520 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	 ***[1]***
3		(1) 3C264	ACS/WFC, ACCUM, WFC1	F606W POL60V		POS TARG 0,0	Pattern 3, Exps 3-3 in ACS Polariz. (01) (3)	260 Secs (520 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	 ***[1]***

Orbit Structure



Visit

Proposal 17781, UVIS imaging (02) Mon Aug 12 18:00:48 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 25D TO 55 D; ORIENT 110D TO 145 D; ORIENT 290D TO 325 D

Comments: We used a 3-point dithering pattern for the sets of F475W (3 exp) and F814W (2 exp) observations in the first orbit, with an additional shorter exposure in the latter filter to fill the orbit (the third exposure is particularly useful to minimize impacts of CR). We used a 4-point dithering pattern for the 4 F225W exposures in the second orbit. Orient constraints are specified to avoid any risk of the central nucleus from producing diffraction spikes that run over the jet. POS TARGS are also used to put the target somewhat closer to the readout corner to minimize CTE.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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)
(2)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(4)
(4)	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)

Fixed Targets

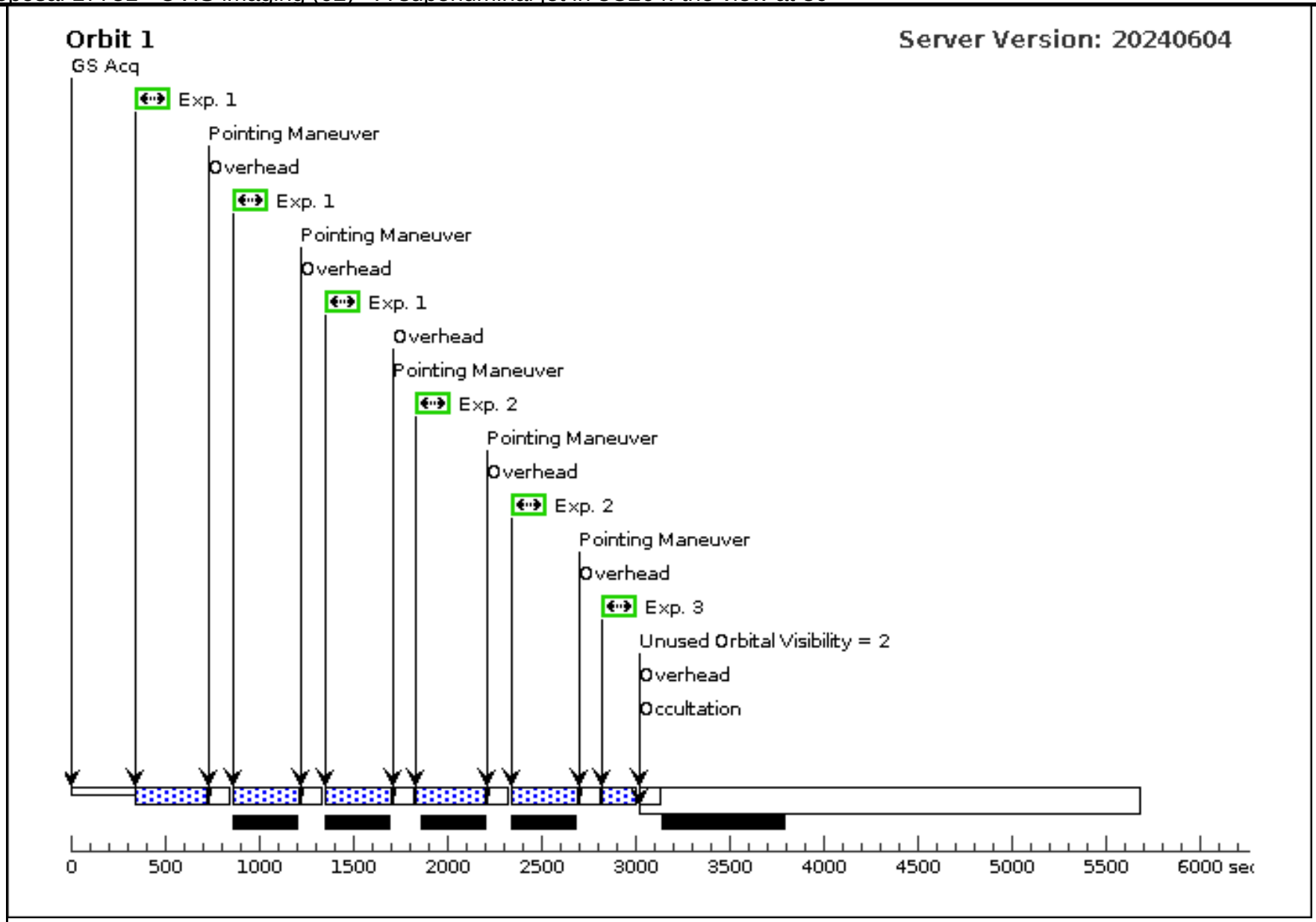
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	3C264	RA: 11 45 5.0090 (176.2708708d) Dec: +19 36 22.74 (19.60632d) Equinox: J2000		V=13.97	Reference Frame: SIMBAD

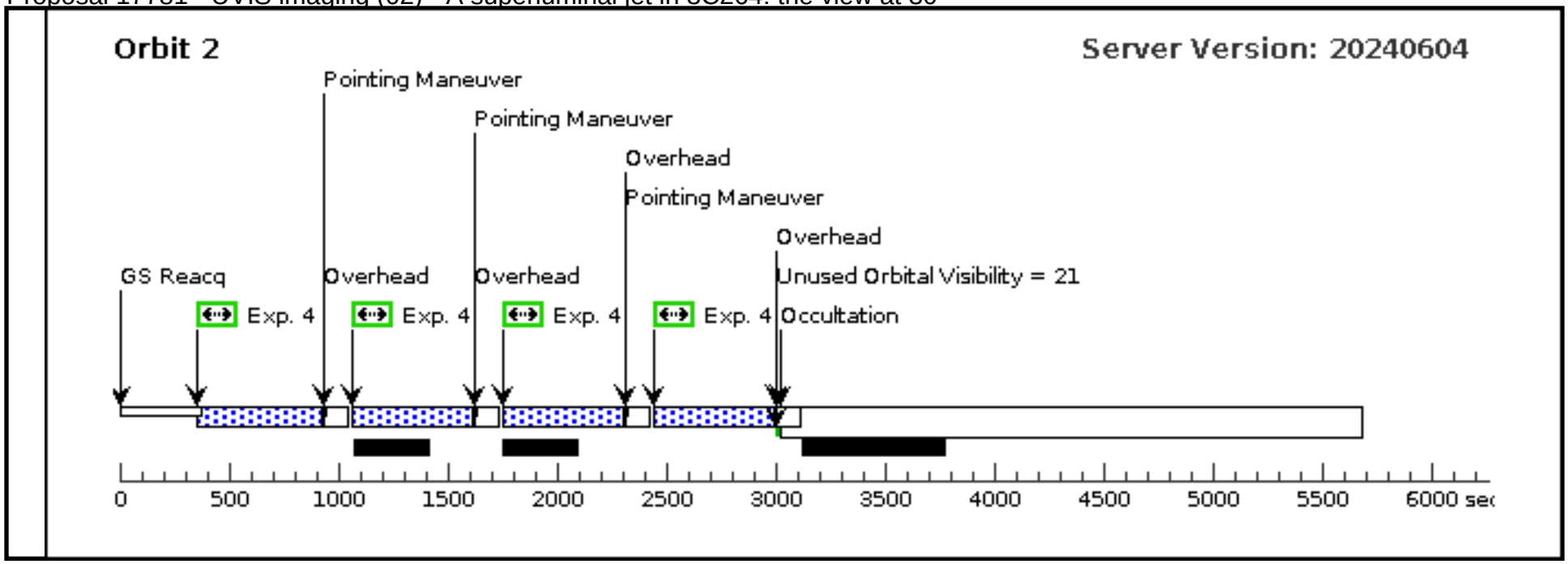
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[ELLIPTICAL, JET, NUCLEUS, RADIO GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) 3C264	WFC3/UVIS, ACCUM, UVIS1	F475W	FLASH=15	POS TARG 30,10	Pattern 1, Exps 1-1 in UVIS imaging (02) (1)	350 Secs (1050 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
2		(1) 3C264	WFC3/UVIS, ACCUM, UVIS1	F814W	FLASH=12	POS TARG 30,10	Pattern 4, Exps 2-2 in UVIS imaging (02) (4)	350 Secs (700 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
3		(1) 3C264	WFC3/UVIS, ACCUM, UVIS1	F814W	FLASH=18	POS TARG 30,10		180 Secs (180 Secs)	
								[==>]	***[1]***
4		(1) 3C264	WFC3/UVIS, ACCUM, UVIS1	F225W	FLASH=19	POS TARG 30,10	Pattern 2, Exps 4-4 in UVIS imaging (02) (2)	550 Secs (2200 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[2]***
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	

Orbit Structure




Orbit 2
Server Version: 20240604
Pointing Maneuver
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
GS Reacq
Overhead
Overhead
Unused Orbital Visibility = 21
Exp. 4
Exp. 4
Exp. 4
Exp. 4
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec