18081 - Using 35 year old tidal disruption events to test the fundamentals of accretion disk theory

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Andy Mummery (PI) (Contact)	**Institute For Advanced Study**
Muryel Guolo (CoI) (CoPI) (Contact)	The Johns Hopkins University
Dr. Suvi Gezari (CoI)	Space Telescope Science Institute

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) NGC-5905	WFC3/UVIS	2	11-Aug-2025 19:00:15.0	yes
02	(2) RXJ1242-11	WFC3/UVIS	2	11-Aug-2025 19:00:15.0	yes
03	(3) RXJ1624+75	WFC3/UVIS	2	11-Aug-2025 19:00:16.0	yes
04	(4) RXJ1420+53	WFC3/UVIS	2	11-Aug-2025 19:00:17.0	yes
05	(5) TDXFJ1347-32	WFC3/UVIS	2	11-Aug-2025 19:00:18.0	yes
06	(6) RBS1032	WFC3/UVIS	2	11-Aug-2025 19:00:18.0	yes

12 Total Orbits Used

ABSTRACT

Tidal Disruption Events (TDEs) occur when stars pass too close to supermassive black holes and are torn apart by tidal forces and subsequently accreted. The oldest known TDE candidates are six sources discovered by the ROSAT X-ray satellite in the 1990's, which showed soft X-ray flares

which decayed to unobservable X-ray flux levels over $\sim 5-10$ years. In the following 20 years our theoretical and observational understanding of TDEs has strengthened, and a substantial breakthrough has occurred: while significant uncertainties remain in the origin of the UV/optical light emitted during the initial flare, late-time optical/UV emission is known to originate from accretion disks in these events, and to last for at least $\gtrsim 2000$ days. This means, despite their X-ray emission having faded decades ago, all six ROSAT TDEs should be bright and detectable in the UV today, over 30 years after disruption. The detection with HST of bright UV emission from these six events would allow six black hole mass measurements to be performed, but the detection or non-detection of each of these systems will teach the disk theory community a great deal about black hole accretion disk stability at low luminosities, something which is observationally inaccessible to any other known massive black hole disk systems.

OBSERVING DESCRIPTION

The proposal aims to observe decade-old (1990s) tidal disruption events (TDEs) using multi-band UV/optical imaging.

We will observe each of the 6 TDEs in 3 filters for 2 orbits each. The first orbit will be in F225W, and the second orbit will be split between F438W and F625W.

Visit

Proposal 18081, NGC-5905 (01) Mon Aug 11 23:00:19 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(1)
(2)	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), (3)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-5905	RA: 15 15 23.3281 (228.8472004d) Dec: +55 31 1.93 (55.51720d) Equinox: J2000	Proper Motion RA: 1.062 mas/yr Proper Motion Dec: 1.188 mas/yr Parallax: 0.0014305000000000001" Epoch of Position: 2000	V=12	Reference Frame: ICRS

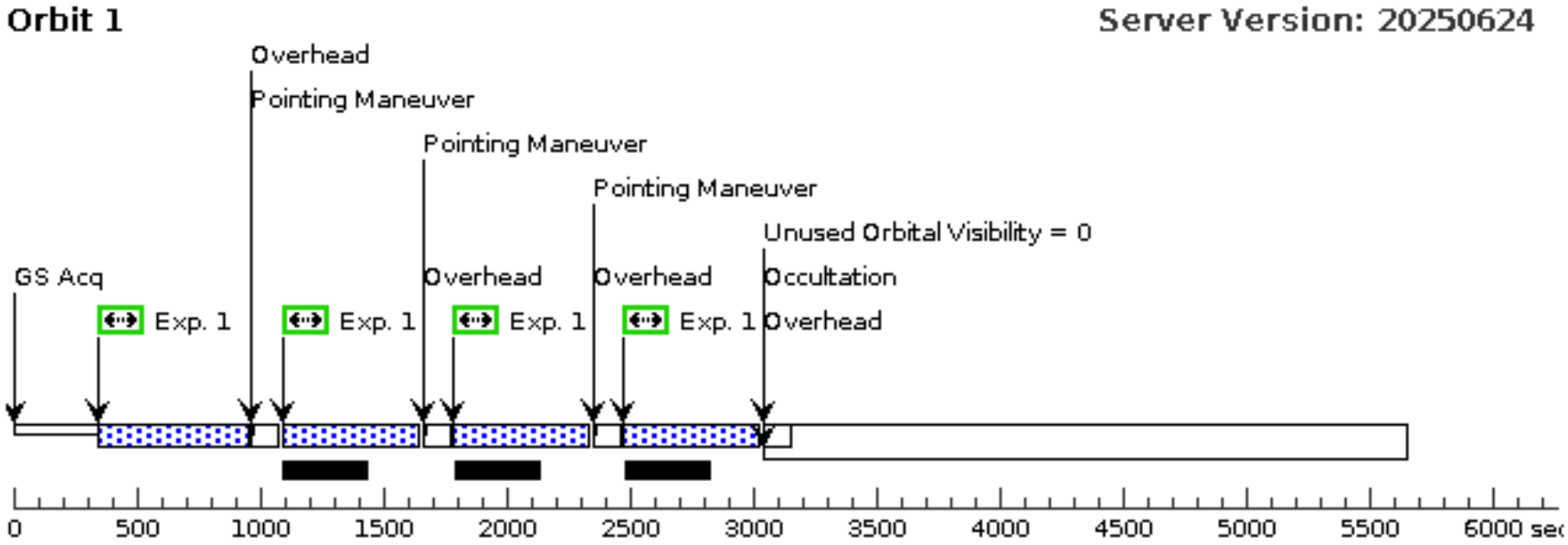
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

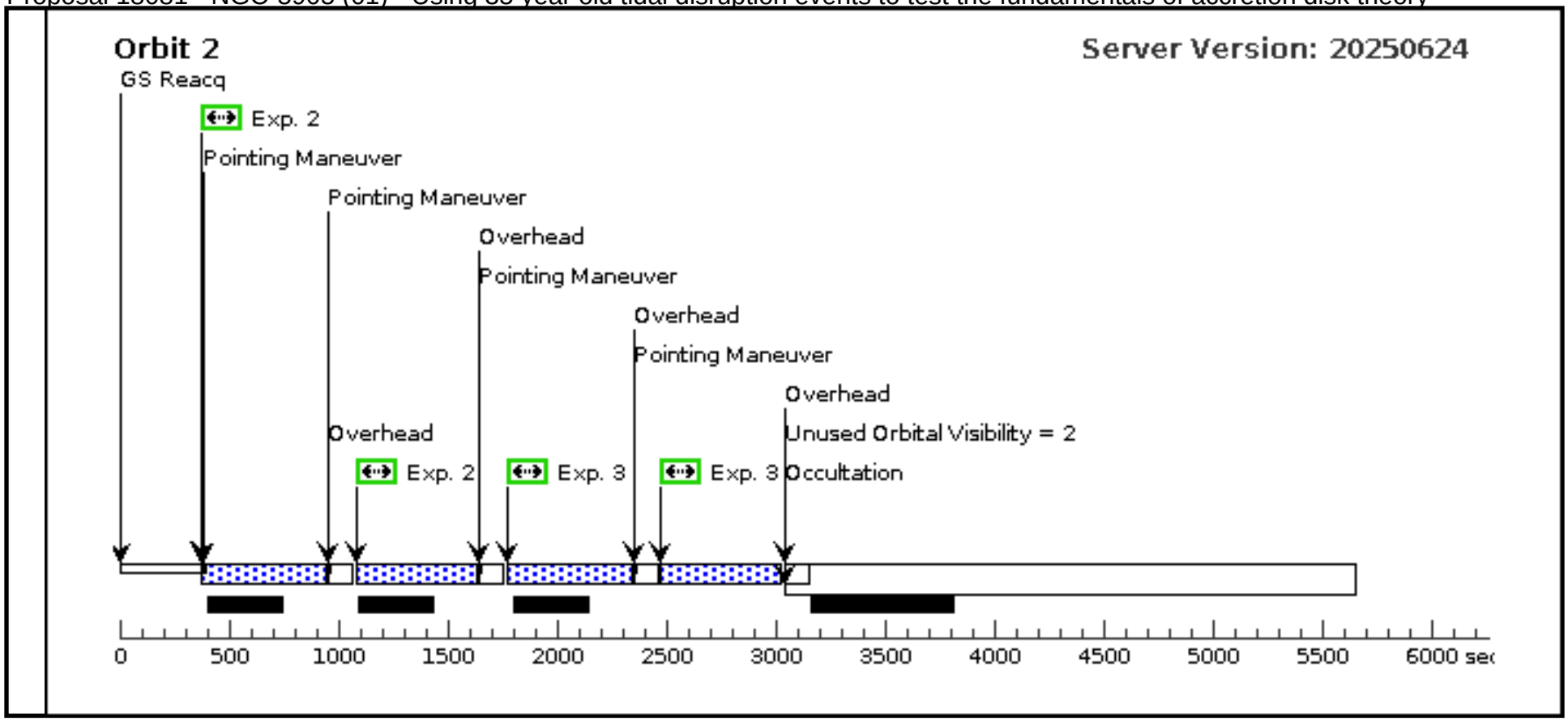
SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=GALAXY
Description=[ACCRETION DISK]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) NGC-5905	WFC3/UVIS, ACCUM, UVIS2	F225W	FLASH=15		Pattern 1, Exps 1-1 in NGC-5905 (01) (1)	555 Secs (2245 Secs) *[==>580.0 Secs (Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) NGC-5905	WFC3/UVIS, ACCUM, UVIS2	F438W	FLASH=15		Pattern 2, Exps 2-2 in NGC-5905 (01) (2)	555 Secs (1102 Secs) *[==>551.0 Secs (Pattern 1)]* *[==>551.0 Secs (Pattern 2)]*	***[2]***
3		(1) NGC-5905	WFC3/UVIS, ACCUM, UVIS2	F625W	FLASH=5		Pattern 2, Exps 3-3 in NGC-5905 (01) (2)	555 Secs (1102 Secs) *[==>551.0 Secs (Pattern 1)]* *[==>551.0 Secs (Pattern 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20250624
GS Reacq
Exp. 2
Pointing Maneuver
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Unused Orbital Visibility = 2
Occultation
Overhead
Exp. 2
Exp. 3
Exp. 3
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6000 sec

Visit

Proposal 18081, RXJ1241-11 (02) Mon Aug 11 23:00:19 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(1)
(2)	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), (3)

Fixed Targets

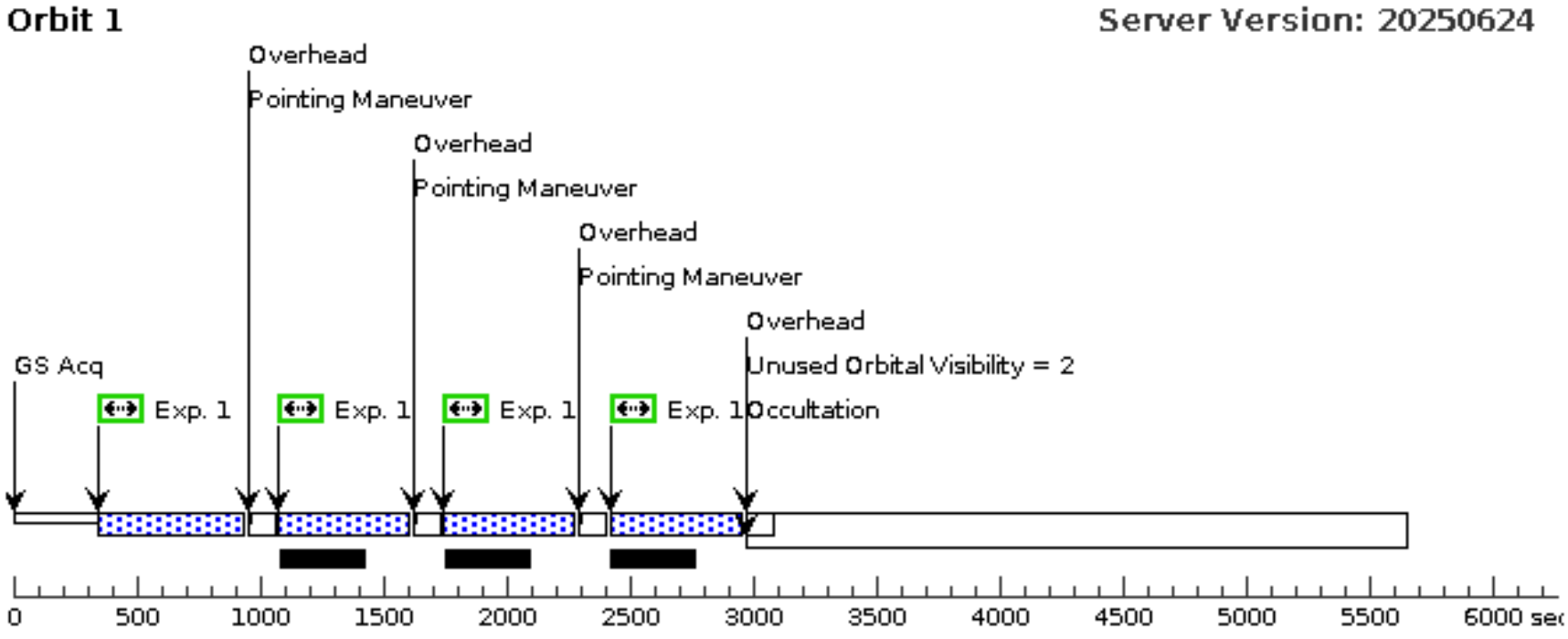
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	RXJ1242-11	RA: 12 42 36.9000 (190.6537500d) Dec: -11 19 35.00 (-11.32639d) Equinox: J2000		V=14	Reference Frame: ICRS

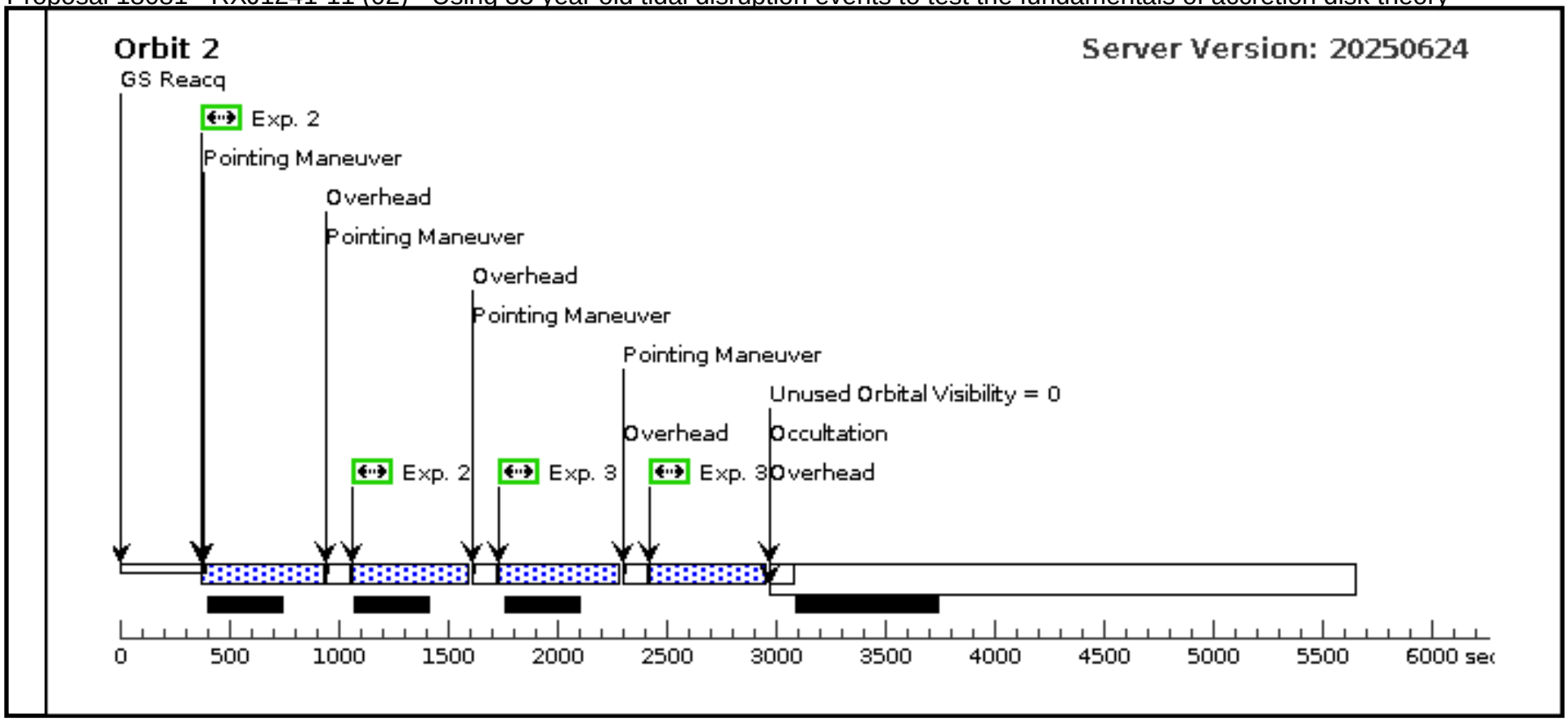
Comments:
Category=GALAXY
Description=[ACCRETION DISK]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) RXJ1242-11	WFC3/UVIS, ACCUM, UVIS2	F225W	FLASH=15		Pattern 1, Exps 1-1 in RXJ1241-11 (02) (1)	555 Secs (2173 Secs) *[==>562.0 Secs (Pattern 1)]* *[==>537.0 Secs (Pattern 2)]* *[==>537.0 Secs (Pattern 3)]* *[==>537.0 Secs (Pattern 4)]*	***[1]***
2		(2) RXJ1242-11	WFC3/UVIS, ACCUM, UVIS2	F438W	FLASH=15		Pattern 2, Exps 2-2 in RXJ1241-11 (02) (2)	555 Secs (1068 Secs) *[==>534.0 Secs (Pattern 1)]* *[==>534.0 Secs (Pattern 2)]*	***[2]***
3		(2) RXJ1242-11	WFC3/UVIS, ACCUM, UVIS2	F625W	FLASH=5		Pattern 2, Exps 3-3 in RXJ1241-11 (02) (2)	555 Secs (1068 Secs) *[==>534.0 Secs (Pattern 1)]* *[==>534.0 Secs (Pattern 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20250624
GS Reacq
Exp. 2
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
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Unused Orbital Visibility = 0
Overhead
Occultation
Exp. 2
Exp. 3
Exp. 3
Overhead
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5500
6000 sec

Visit

Proposal 18081, RXJ1624+75 (03) Mon Aug 11 23:00:19 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(1)
(2)	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), (3)

Fixed Targets

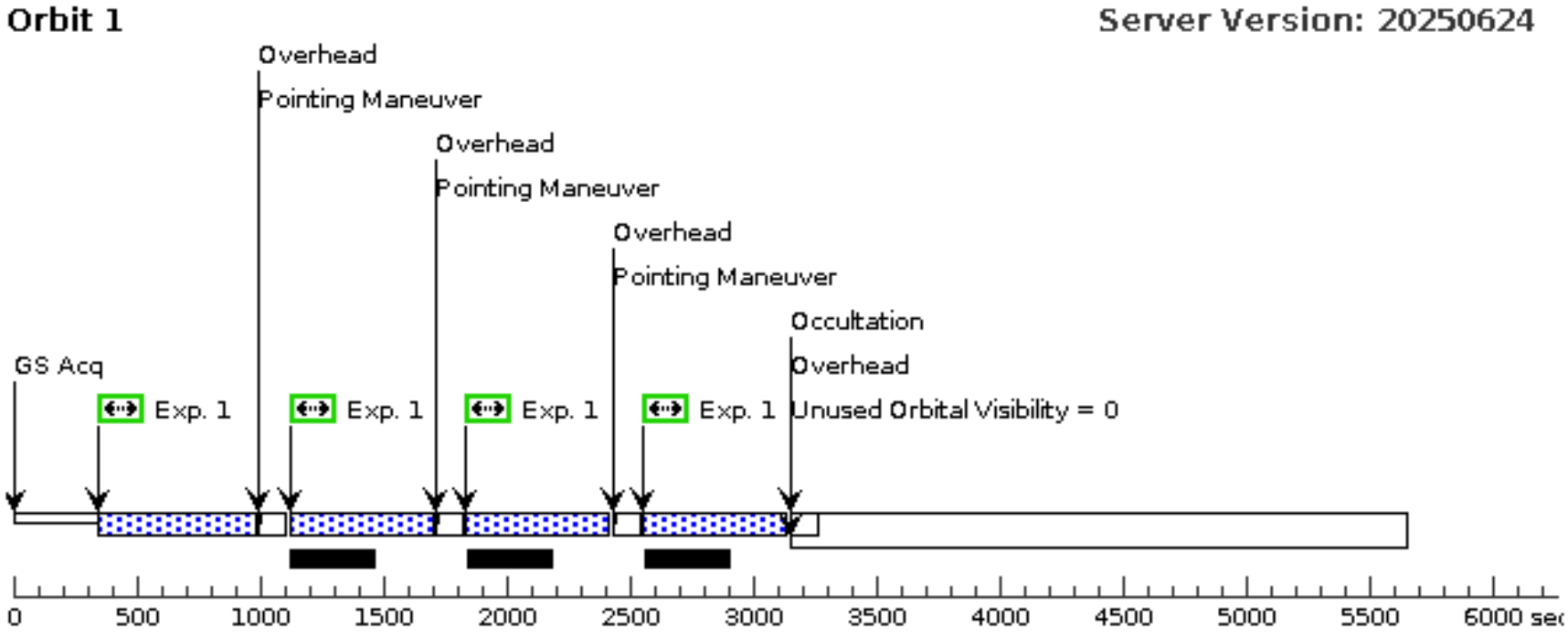
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	RXJ1624+75	RA: 16 24 56.5000 (246.2354167d) Dec: +75 54 55.80 (75.91550d) Equinox: J2000		V=15	Reference Frame: ICRS

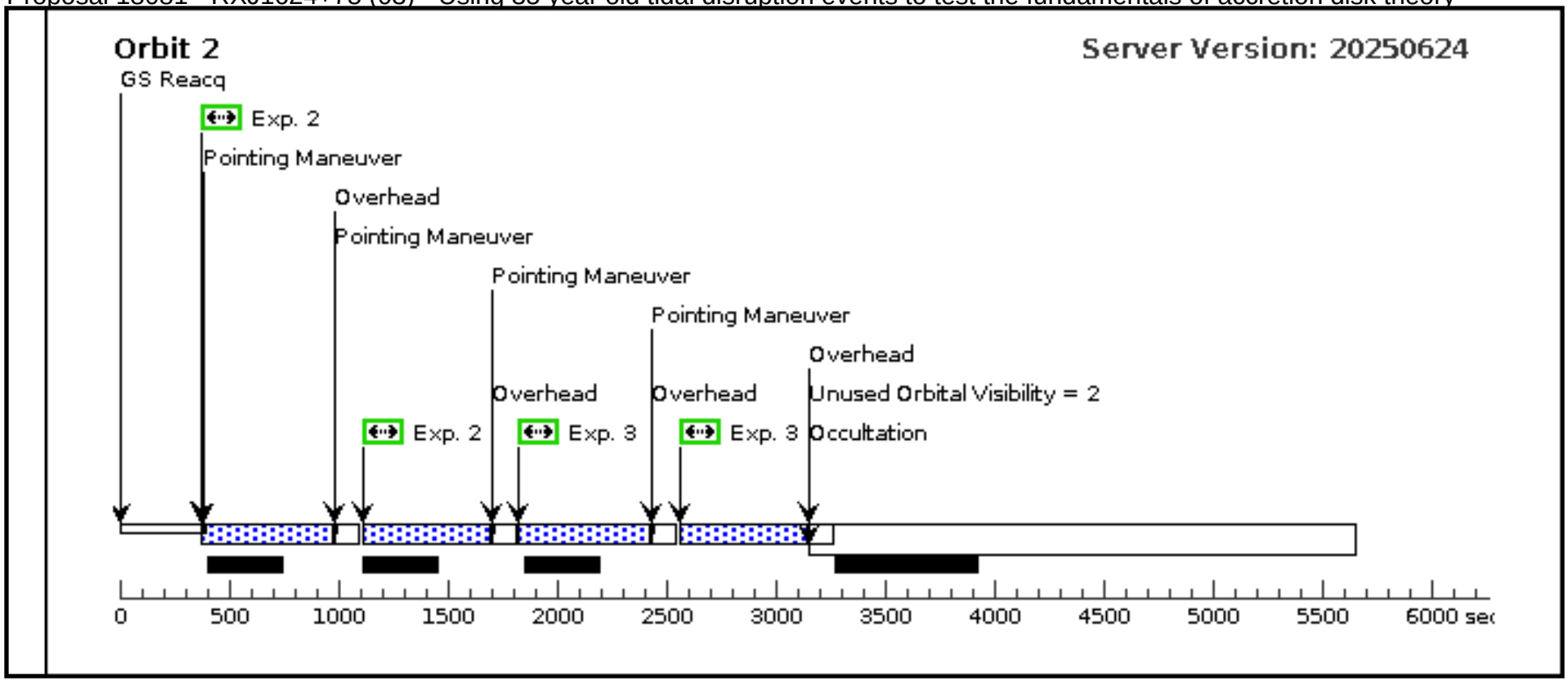
Comments:
Category=GALAXY
Description=[ACCRETION DISK]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) RXJ1624+75	WFC3/UVIS, ACCUM, UVIS2	F225W	FLASH=15		Pattern 1, Exps 1-1 in RXJ1624+75 (03) (1)	555 Secs (2353 Secs) *[==>607.0 Secs (Pattern 1)]* *[==>582.0 Secs (Pattern 2)]* *[==>582.0 Secs (Pattern 3)]* *[==>582.0 Secs (Pattern 4)]*	***[1]***
2		(3) RXJ1624+75	WFC3/UVIS, ACCUM, UVIS2	F438W	FLASH=15		Pattern 2, Exps 2-2 in RXJ1624+75 (03) (2)	555 Secs (1156 Secs) *[==>578.0 Secs (Pattern 1)]* *[==>578.0 Secs (Pattern 2)]*	***[2]***
3		(3) RXJ1624+75	WFC3/UVIS, ACCUM, UVIS2	F625W	FLASH=5		Pattern 2, Exps 3-3 in RXJ1624+75 (03) (2)	555 Secs (1156 Secs) *[==>578.0 Secs (Pattern 1)]* *[==>578.0 Secs (Pattern 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20250624
GS Reacq
Exp. 2
Pointing Maneuver
Overhead
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Overhead
Overhead
Overhead
Unused Orbital Visibility = 2
Exp. 2
Exp. 3
Exp. 3
Occultation
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500
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5500
6000 sec

Visit

Proposal 18081, RXJ1420+53 (04) Mon Aug 11 23:00:19 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(1)
(2)	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), (3)

Fixed Targets

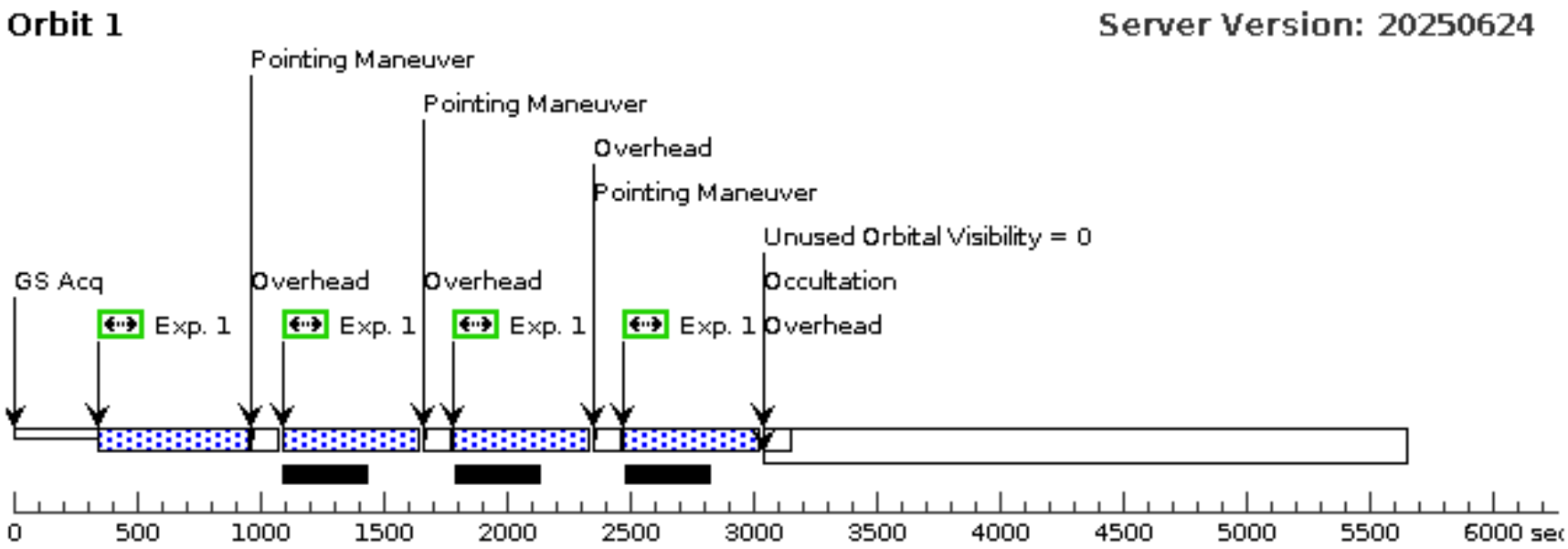
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	RXJ1420+53	RA: 22 17 57.1000 (334.4879167d) Dec: -59 41 34.00 (-59.69278d) Equinox: J2000		V=15	Reference Frame: ICRS

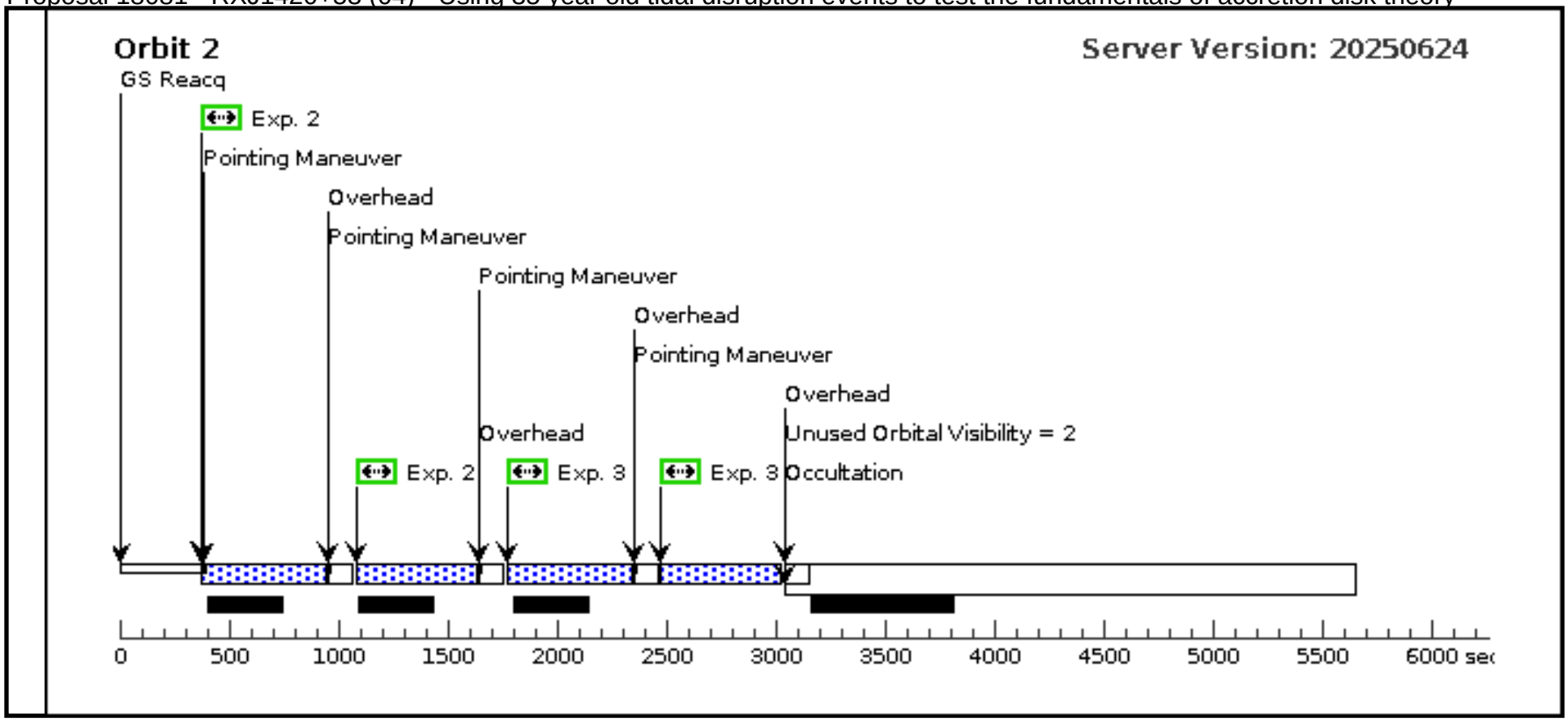
Comments:
Category=GALAXY
Description=[ACCRETION DISK]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) RXJ1420+53	WFC3/UVIS, ACCUM, UVIS2	F225W	FLASH=15		Pattern 1, Exps 1-1 in RXJ1420+53 (04) (1)	555 Secs (2245 Secs) *[==>580.0 Secs (Pattern 1)]* *[==>555.0 Secs (Pattern 2)]* *[==>555.0 Secs (Pattern 3)]* *[==>555.0 Secs (Pattern 4)]*	***[1]***
2		(4) RXJ1420+53	WFC3/UVIS, ACCUM, UVIS2	F438W	FLASH=15		Pattern 2, Exps 2-2 in RXJ1420+53 (04) (2)	555 Secs (1102 Secs) *[==>551.0 Secs (Pattern 1)]* *[==>551.0 Secs (Pattern 2)]*	***[2]***
3		(4) RXJ1420+53	WFC3/UVIS, ACCUM, UVIS2	F625W	FLASH=5		Pattern 2, Exps 3-3 in RXJ1420+53 (04) (2)	555 Secs (1102 Secs) *[==>551.0 Secs (Pattern 1)]* *[==>551.0 Secs (Pattern 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20250624
GS Reacq
Exp. 2
Pointing Maneuver
Overhead
Pointing Maneuver
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Unused Orbital Visibility = 2
Overhead
Exp. 2
Exp. 3
Exp. 3
Occultation
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500
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3500
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4500
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5500
6000 sec

Visit

Proposal 18081, TDXFJ1347-32 (05) Mon Aug 11 23:00:19 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(1)
(2)	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), (3)

Fixed Targets

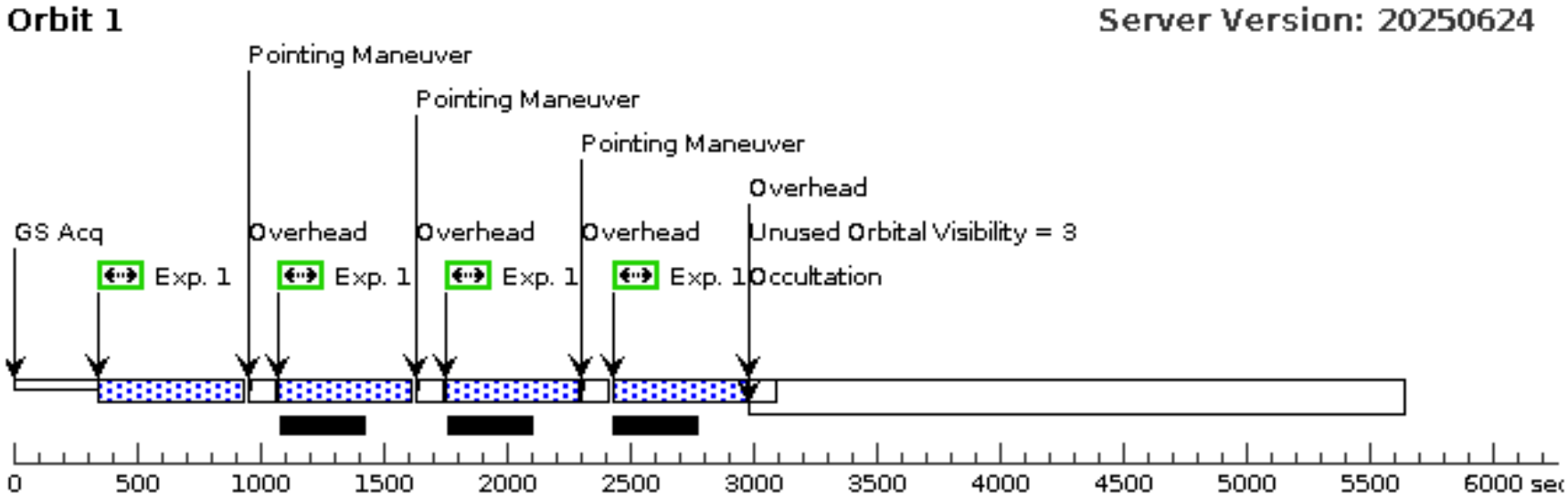
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	TDXFJ1347-32	RA: 13 47 30.3300 (206.8763750d) Dec: -32 54 50.60 (-32.91406d) Equinox: J2000		V=15	Reference Frame: ICRS

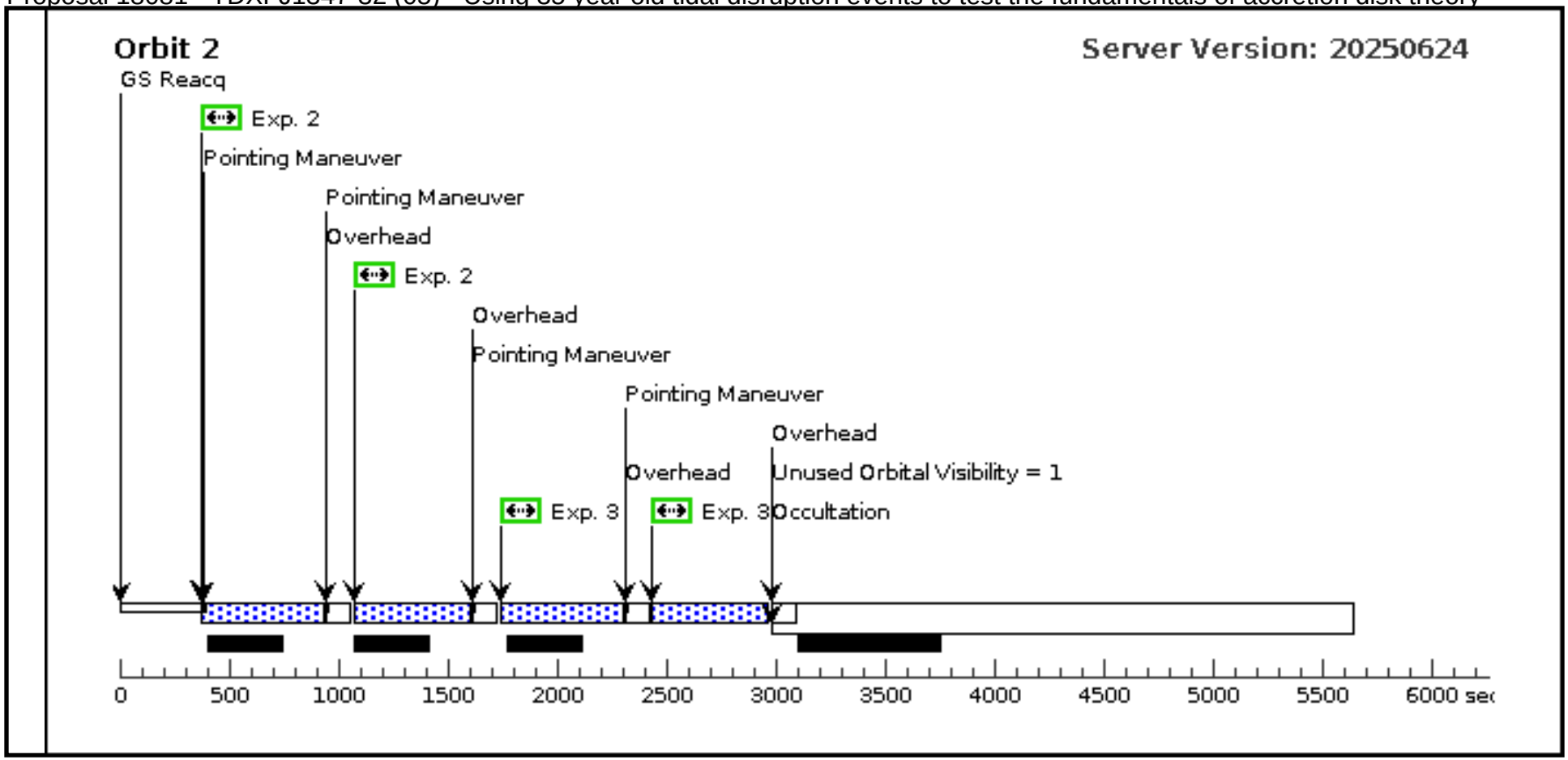
Comments:
Category=GALAXY
Description=[ACCRETION DISK]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(5) TDXFJ1347-32	WFC3/UVIS, ACCUM, UVIS2	F225W	FLASH=15		Pattern 1, Exps 1-1 in TDXFJ1347-32 (05) (1)	555 Secs (2185 Secs) *[==>565.0 Secs (Pattern 1)]* *[==>540.0 Secs (Pattern 2)]* *[==>540.0 Secs (Pattern 3)]* *[==>540.0 Secs (Pattern 4)]*	***[1]***
2		(5) TDXFJ1347-32	WFC3/UVIS, ACCUM, UVIS2	F438W	FLASH=15		Pattern 2, Exps 2-2 in TDXFJ1347-32 (05) (2)	555 Secs (1074 Secs) *[==>537.0 Secs (Pattern 1)]* *[==>537.0 Secs (Pattern 2)]*	***[2]***
3		(5) TDXFJ1347-32	WFC3/UVIS, ACCUM, UVIS2	F625W	FLASH=5		Pattern 2, Exps 3-3 in TDXFJ1347-32 (05) (2)	555 Secs (1074 Secs) *[==>537.0 Secs (Pattern 1)]* *[==>537.0 Secs (Pattern 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20250624
GS Reacq
Exp. 2
Pointing Maneuver
Pointing Maneuver
Overhead
Exp. 2
Overhead
Pointing Maneuver
Pointing Maneuver
Overhead
Overhead
Unused Orbital Visibility = 1
Exp. 3
Exp. 3
Occultation
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5500
6000 sec

Visit

Proposal 18081, RBS1032 (06) Mon Aug 11 23:00:19 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(1)
(2)	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), (3)

Fixed Targets

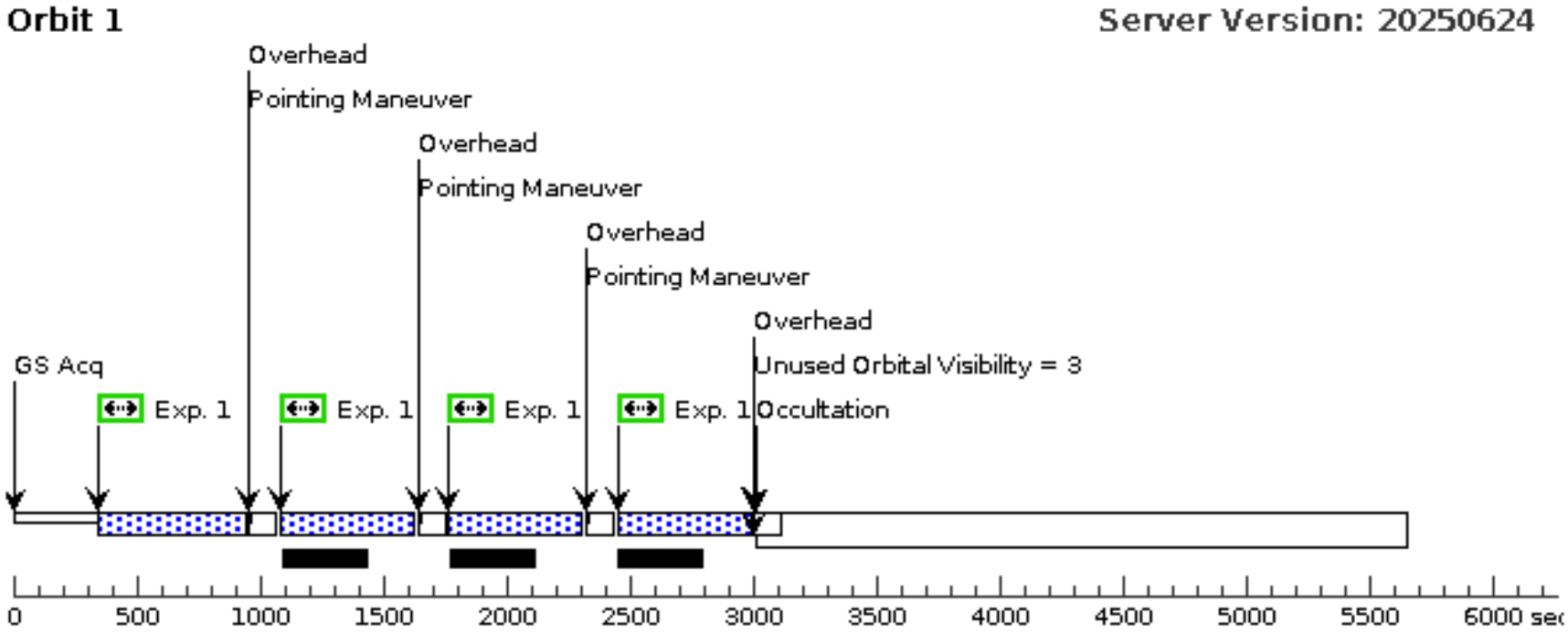
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	RBS1032	RA: 11 47 26.7300 (176.8613750d) Dec: +49 42 57.30 (49.71592d) Equinox: J2000		V=15	Reference Frame: ICRS

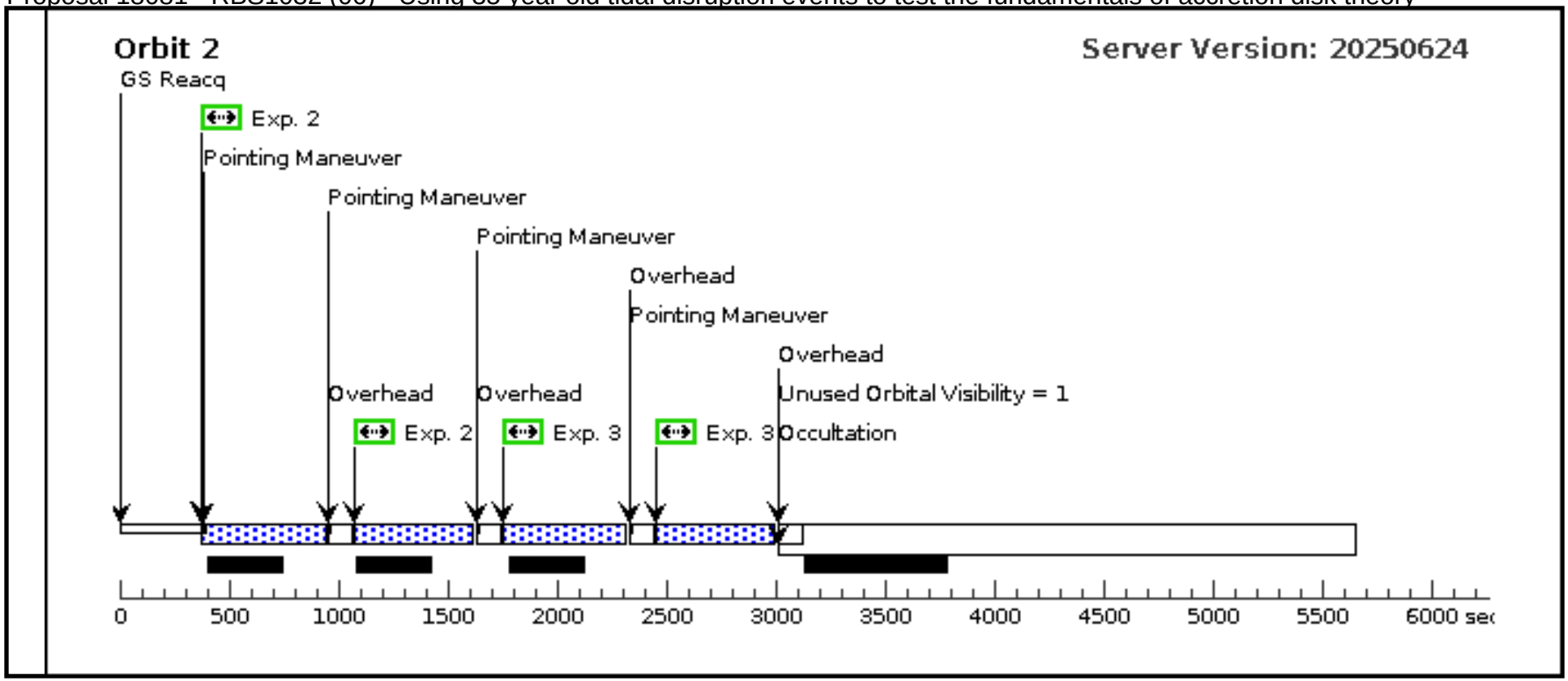
Comments:
Category=GALAXY
Description=[ACCRETION DISK]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(6) RBS1032	WFC3/UVIS, ACCUM, UVIS2	F225W	FLASH=15		Pattern 1, Exps 1-1 in RBS1032 (06) (1)	555 Secs (2209 Secs) *[==>571.0 Secs (Pattern 1)]* *[==>546.0 Secs (Pattern 2)]* *[==>546.0 Secs (Pattern 3)]* *[==>546.0 Secs (Pattern 4)]*	***[1]***
2		(6) RBS1032	WFC3/UVIS, ACCUM, UVIS2	F438W	FLASH=15		Pattern 2, Exps 2-2 in RBS1032 (06) (2)	555 Secs (1086 Secs) *[==>543.0 Secs (Pattern 1)]* *[==>543.0 Secs (Pattern 2)]*	***[2]***
3		(6) RBS1032	WFC3/UVIS, ACCUM, UVIS2	F625W	FLASH=5		Pattern 2, Exps 3-3 in RBS1032 (06) (2)	555 Secs (1086 Secs) *[==>543.0 Secs (Pattern 1)]* *[==>543.0 Secs (Pattern 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20250624
GS Reacq
Exp. 2
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Unused Orbital Visibility = 1
Occultation
Overhead
Overhead
Exp. 2
Exp. 3
Exp. 3
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3500
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4500
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5500
6000 sec